鼠 Chinese and Japanese calendars 戊子

(from a Japanese perspective)

ロジェル ドニ
(Denis Roegel)
(roegel@loria.fr)

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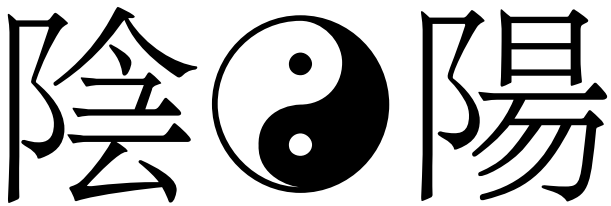


Warning

This presentation certainly contains flaws and you, reader, can improve it by notifying me about

- Hànzì errors, or the possibly inacceptable usage of simplified and traditional Chinese;
- pinyin, Japanese, Korean, Vietnamese or English language errors;
- serious gaps;
- historical errors;
- typographical errors;
- etc.

Thank you very much in advance!

Mystery?

?

[M]ost [Chinese] people do not understand the regularities and patterns of the [Chinese] calendar.

(the authors of an article on a Chinese calendar savant, 1991)

?

What do we know about Chinese and Japanese calendars?

Until recently, there was very little information in western languages:

- the classical western treatises (Matzka 1844, Bouchet 1868, etc.) do not cover the subject at all;
- several popular books (such as Lefort 1998) give only an incomplete description, often with errors;
- at best, the general public knows that the years have animal names (currently the rat), perhaps some connection with the Moon, and that the Chinese celebrate a shifted New Year, in their own way;
- during the past few years, things have changed, because information circulates better thanks to the internet, and there are more and more means to convert dates between calendars;
- one of the aims of this talk is to get all these facts right.

Aims of this presentation

- introduction to the foundations of the Chinese and Japanese calendars:
  - some history;
  - some calendars;
  - some astronomy;
  - some mathematics;
  - some Chinese;
  - some Japanese, and
  - surprises;
- what you won't find much here:
  - the time in the day;
  - horology;
  - the traditions associated to the various festivals;
  - Chinese and Japanese astrology;
  - Feng Shui;
  - etc.

Contents

Calendars and celestial motions

What is a calendar?

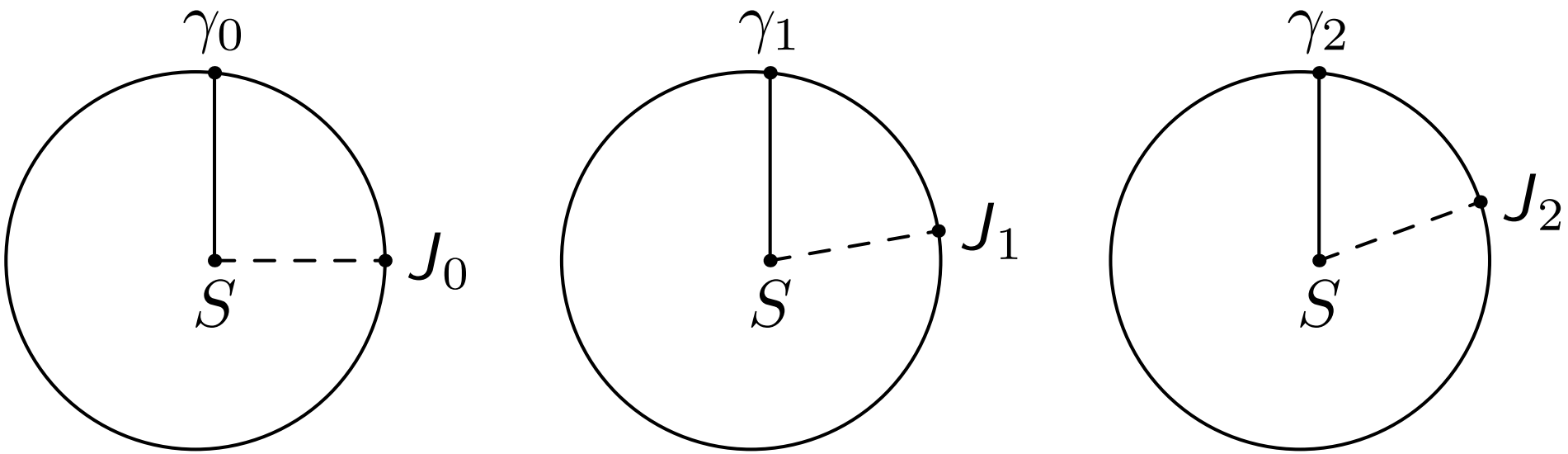
- as a consequence of the Earth's rotation, our time is divided into days;
- in the West, days are grouped in weeks, months and years;
- the largest structure usually corresponds to the seasons which return after little more than 365 days; the seasons are due to the Earth's orientation with respect to the Sun and not to its distance to the Sun;
- the year of the seasons is the tropical year;
- months originate from the lunar month (time between two identical phases of the Moon), which is about 29.5 days;
- problem: 365 days (and a little more) $\neq$ twelve lunar months (354 days).

Julian calendar (from Julius Caesar to the 16th century)

- calendar used in the West before 1582;
- named by reference to Julius Caesar;
- 365 days year, with an additional leap day every four years;
- average length of a year: $365 + \frac{1}{4} = 365.25$ days;
- problem: the beginning of Spring currently recurs after about 365.2422 days;
- the beginning of the Spring was drifting with respect to the year, and in 1582 the drift had reached about 10 days.

Julian calendar (from Julius Caesar to the 16th century)

Precession of γ with respect to the start of the year



- γ_i: start of Spring;
- J_i: start of the Julian year;
- from γ_i to γ_{i+1}: 365.2422 days;
- from J_i to J_{i+1}: 365.25 days;
- problem: γ_i comes closer and closer to J_i.

Gregorian calendar (16th century — today)

- the 1582 reform shortened the Julian year which was slightly too long;
- three days were removed over 400 years: the century years which are not multiple of 400 are no longer leap years (1700, 1800, 1900, 2100, etc.);
- the average length of the Gregorian year is therefore $365 + \frac{1}{4} - \frac{3}{400} = 365.2425$ days, which is a better approximation of 365.2422 than 365.25;

Lunisolar calendars

- lunisolar calendars try to match two incommensurable periods:
  - lunar (synodic) month of 29.53 days (29 d 12 h 44 mn 3 s)
  - tropical year of 365.2422 days (365 d 5 h 48 mn 45 s in 2000)
- Hebrew, Chinese, Indian, etc. calendars;
- also the Gregorian calendar (Easter date);
- some years have 12 lunar months, others have 13;
- existence of cycles or pseudo-cycles, for instance 19-year cycle after which the phases of the Moon recur almost on the same dates (because $19 \times 365.25 \approx 235 \times 29.530589$).

Chinese calendar (中國曆, ちゅうごくれき)

Chinese calendar (中國曆, ちゅうごくれき)

History

- China has a very long written history, during which many dynasties ruled one after the other;
- a calendar was already used by the Shang dynasty (商), as this is testified by oracle bones (ca. 1500 to 1000 B.C.);
- the promulgation of an official calendar was one of the most important acts of a Chinese Emperor;
- the calendar was astronomically determined;
- the knowledge of celestial motions has improved over time;

Chinese calendar (中國曆, ちゅうごくれき)

An oracle bone (甲骨, jiǎ gǔ piàn)

Chinese calendar (中國曆, ちゅうごくれき)

History (2)

- in the 13th century B.C., China knew that a lunar month is about 29.53 days;
- in 237 C.E., the value 29.530598 was obtained;
- the real value is about 29.530588 days;
- around 100 calendars followed eachother from the 3rd century B.C. to the 19th century C.E.;
- the main reforms (in 619, 1280 and 1645) were all carried out with the help of foreigners (Indian, Muslim or Jesuit astronomers);
- the current rules were formulated by the German Adam Schall, who became director of the Bureau of Celestial Affairs, around 1645.

Chinese calendar: what the Jesuits brought in the 17th century

Matteo Ricci = Lì Mǎdòu (利瑪竇) (1552–1610)
Johann Terrenz (Schreck) = Dèng Yùhán (鄧玉函) (1576–1630)
Giacomo Rhò = Luó Yǎgǔ (羅雅谷) (1593–1638)

Xú Guāngqǐ (徐光啓) (1562–1633)

Johann Adam Schall von Bell Tāng Rùowàng (湯若望) (1591–1666)

Ferdinand Verbiest Nán Huáirén (南懷仁) (1623–1688)

Chinese calendar (中國曆, ちゅうごくれき)

History: promulgation of new calendars

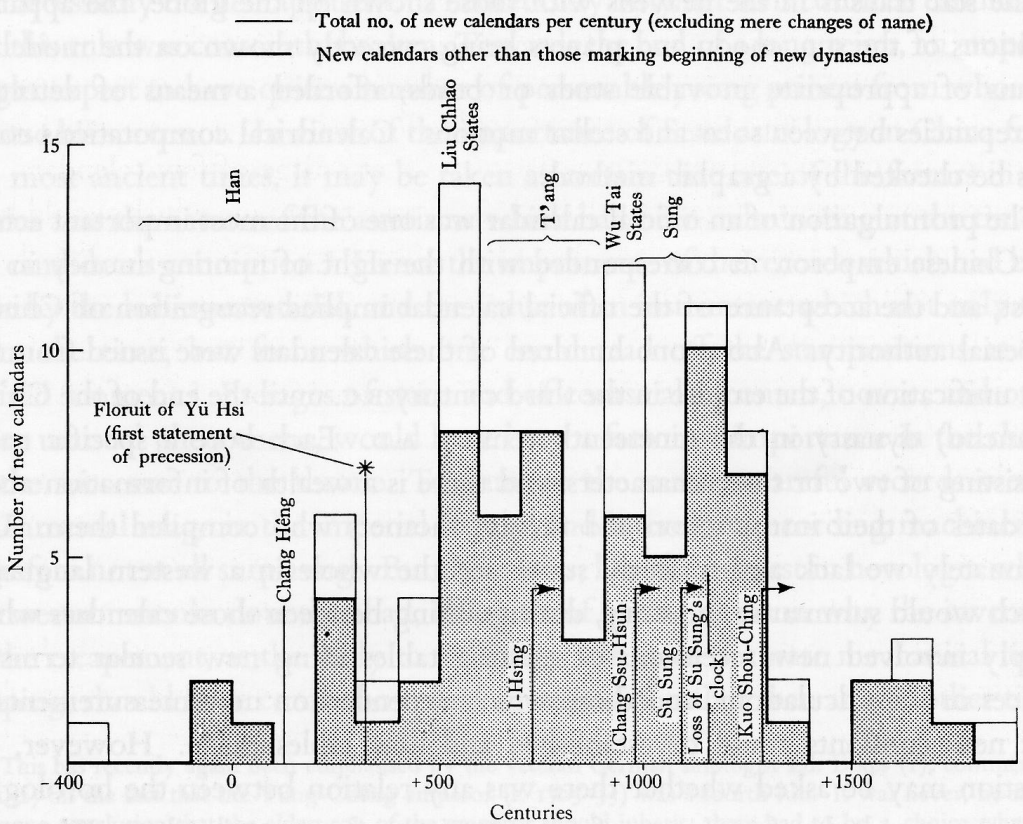


Fig. 61. Relation of calendar-making to the invention of the escapement; plot of the number of new calendars introduced in each century between 400 B.C. and A.D. 1900 (from Needham (1), vol. 4; data from Chu Wên-Hsin).

Creation of calendars, for each century, from 400 B.C. to 1900 (Needham, 1986).

Chinese calendar (中國曆, ちゅうごくれき)

History: promulgation of new calendars

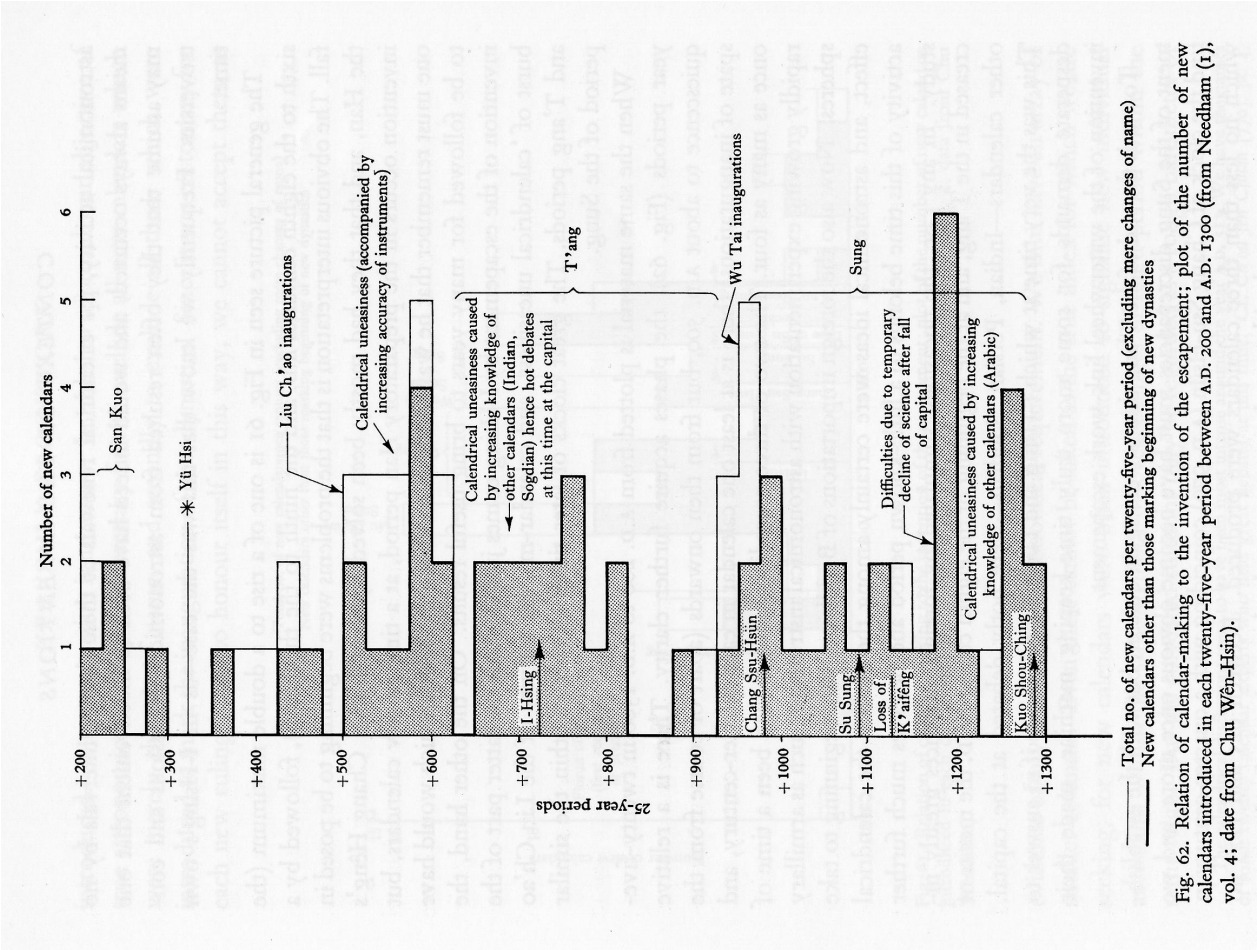


Fig. 62. Relation of calendar-making to the invention of the escapement; plot of the number of new calendars introduced in each twenty-five-year period between A.D. 200 and A.D. 1300 (from Needham (1), vol. 4; date from Chu Wên-Hsin).

Creation of calendars, for each century quarter, from 200 C.E. to 1300 (Needham, 1986).

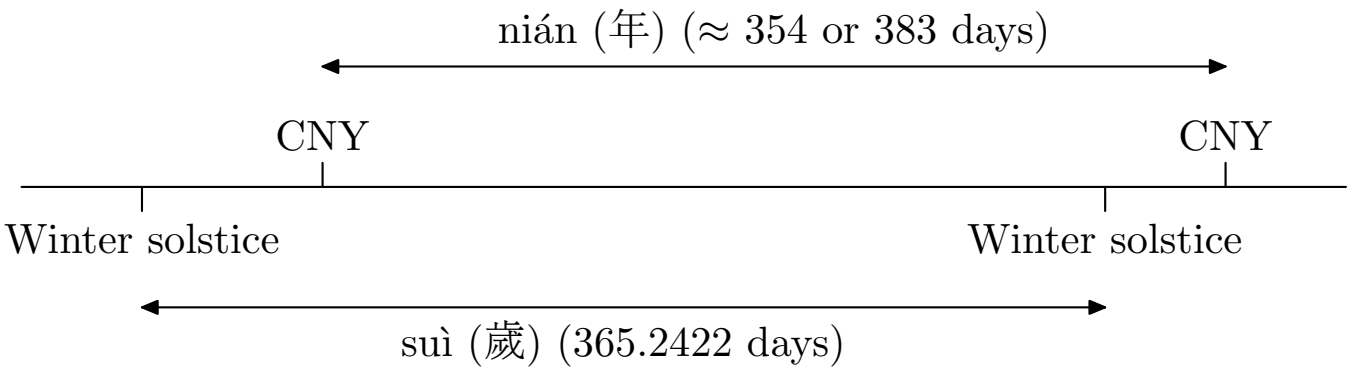
Chinese calendars: examples

- 大統歷 (dà tǒng lì) or 授時歷 (shòu shí lì) [じゅじれき in Japan]: calendar used from 1281 until 1644;
- 時憲歷 (shí xiàn lì): calendar used from 1645 until ???

Chinese calendars

Nowadays, there are actually *two* concurrent Chinese calendars:

- a solar calendar, the "suì" (歲), from one Winter solstice (冬至) to the next; it is also called "farmer's calendar" (農歷);
- a lunisolar calendar, the "nián" (年) [ねん], often mistakenly labelled 農歷, starting at Chinese New Year (CNY) and made of 12 or 13 lunar months;
- two of the festivals are purely solar ones, the others are lunar festivals.



The Western calendar in China

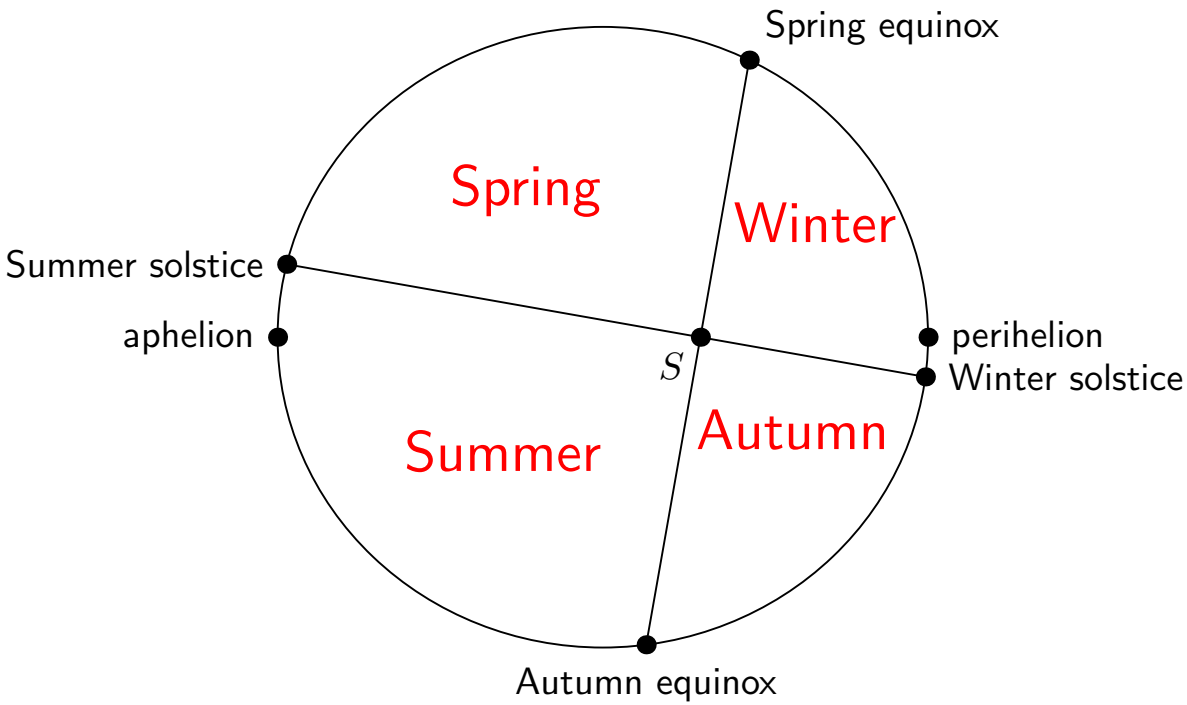
The Chinese civil calendar is the Western (Gregorian) calendar, also called

- 公歷 (gōng lì): public calendar;
- 西歷 (xī lì): Western calendar.

It is the official calendar since 1929, but it had already been adopted by the business world in 1912.

The Chinese solar calendar

The Western world has four seasons (Spring, Summer, Fall and Winter), corresponding to the four "quarters" of the revolution of the Earth around the Sun (S: Sun or Earth):

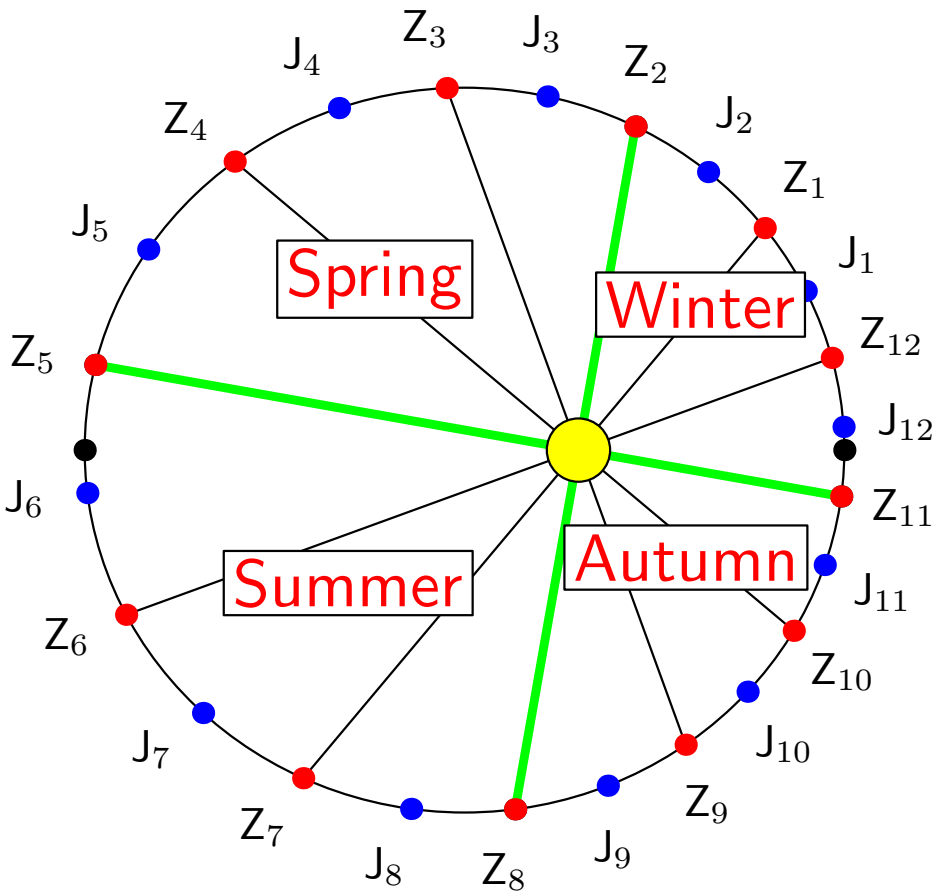


Note that the quarters are not all of the same length.

The Chinese solar calendar (cont'd)

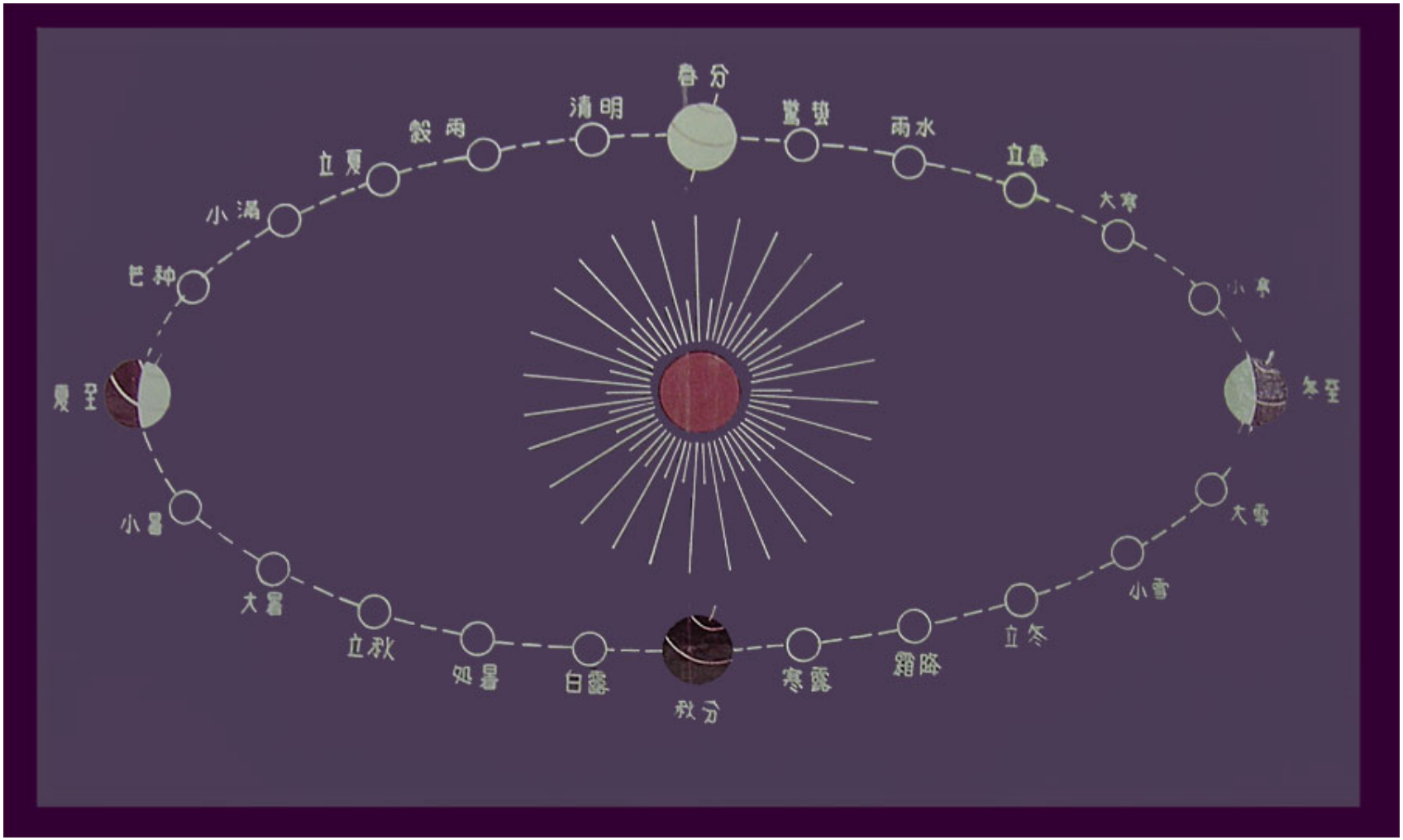
- in the Chinese solar calendar, the time between two solstices (至, zhì [じ]) is divided into 24 sub-intervals (or solar terms);
- the beginnings of these terms are the "jié qì" (節氣) [せっき];
- the Spring Equinox (春分, chūn fēn [しゅんぶん]) is arbitrarily the fourth term;
- the even terms are called major terms or "zhōng qì" (中氣) [ちゅうき]; they are the midpoints (中) of twelve intervals;
- the odd terms are called minor terms or "jié qì" (節氣) [せっき];

The Chinese solar calendar (cont'd)



- Z_2 corresponds to the γ point (start of Spring);
- the J_i and Z_i are separated by 15° (from the Sun);
- the Z_i are also the beginnings of our zodiac signs: Z_2 for Aries, Z_3 for Taurus, Z_4 for Gemini, etc.;
- the J_i are the midpoints of our Zodiac signs.

The 24 “jié qì” (節氣)



The 24 “jié qì” (節氣) (beginning)

J_1	Lì chūn	立春	start of Spring	≈ February 4
Z_1	Yǔ shuǐ	雨水	rain water	≈ February 19
J_2	Jīng zhé	驚蟄	awakening of insects	≈ March 6
Z_2	Chūn fēn	春分	Spring equinox	≈ March 21
J_3	Qīng míng	清明	clear and bright	≈ April 5
Z_3	Gǔ yǔ	穀雨	grain rain	≈ April 20
J_4	Lì xià	立夏	start of Summer	≈ May 6
Z_4	Xiǎo mǎn	小滿	grain full	≈ May 21
J_5	Máng zhòng	芒種	grain in ear	≈ June 6
Z_5	Xià zhì	夏至	Summer solstice	≈ June 22
J_6	Xiǎo shǔ	小暑	minor heat	≈ July 7
Z_6	Dà shǔ	大暑	major heat	≈ July 23

The 24 "jié qì" (節氣) (end)

J_7	Lì qiū	立秋	start of fall	≈ August 8
Z_7	Chǔ shǔ	處暑	limit of heat	≈ August 23
J_8	Bái lù	白露	white dew	≈ September 8
Z_8	Qiū fēn	秋分	Fall equinox	≈ September 23
J_9	Hán lù	寒露	cold dew	≈ October 8
Z_9	Shuāng jiàng	霜降	frost descent	≈ October 24
J_{10}	Lì dōng	立冬	start of Winter	≈ November 8
Z_{10}	Xiǎo xuě	小雪	minor snow	≈ November 22
J_{11}	Dà xuě	大雪	major snow	≈ December 7
Z_{11}	Dōng zhì	冬至	Winter solstice	≈ December 22
J_{12}	Xiǎo hán	小寒	minor cold	≈ January 6
Z_{12}	Dà hán	大寒	major cold	≈ January 20

The 二十四節気 (にじゅうしせっき) in Japan

- the 歳 is divided into twelve 節 (せつ, setsu);
- the beginning of a せつ is a 節気 (せっき, sekki), these are the J_i;
- the midpoint of a せつ is a 中気 (ちゅうき, chūki), they are the Z_i;
- the numbering of the 節気 and 中気 is apparently slightly different from the above and the Winter solstice is the first 中気 (whereas it was Z_{11} previously);
- the first 節気 therefore occurs around December 7;
- the numbering of the 節気 and 中気 plays no role.

The 二十四節気 (にじゅうしせっき) in Japan (beginning)

J_1	Lì chūn	立春	risshun	立春	start of Spring
Z_1	Yǔ shuǐ	雨水	usui	雨水	rain water
J_2	Jīng zhé	驚蟄	keichitsu	啓蟄	awakening of insects
Z_2	Chūn fēn	春分	shunbun	春分	Spring equinox
J_3	Qīng míng	清明	seimei	清明	clear and bright
Z_3	Gǔ yǔ	穀雨	kokuu	穀雨	grain rain
J_4	Lì xià	立夏	rikka	立夏	start of Summer
Z_4	Xiǎo mǎn	小滿	shōman	小満	grain full
J_5	Máng zhòng	芒種	bōshu	芒種	grain in ear
Z_5	Xià zhì	夏至	geshi	夏至	Summer solstice
J_6	Xiǎo shǔ	小暑	shōsho	小暑	minor heat
Z_6	Dà shǔ	大暑	taisho	大暑	major heat

In red: traditional Hànzì $\neq$ Kanji.

The 二十四節気 in Japan (end)

J_7	Lì qiū	立秋	risshū	立秋	start of Fall
Z_7	Chǔ shǔ	處暑	shosho	処暑	limit of heat
J_8	Bái lù	白露	hakuro	白露	white dew
Z_8	Qiū fēn	秋分	shūbun	秋分	Fall equinox
J_9	Hán lù	寒露	kanro	寒露	cold dew
Z_9	Shuāng jiàng	霜降	sōkō	霜降	frost descent
J_{10}	Lì dōng	立冬	rittō	立冬	start of Winter
Z_{10}	Xiǎo xuě	小雪	shōsetsu	小雪	minor snow
J_{11}	Dà xuě	大雪	taisetsu	大雪	major snow
Z_{11}	Dōng zhì	冬至	tōji	冬至	Winter solstice
J_{12}	Xiǎo hán	小寒	shōkan	小寒	minor cold
Z_{12}	Dà hán	大寒	daikan	大寒	major cold

The 24 "jié qì": observations

- beginnings of Western seasons:
  - Z_2 (春分 [しゅんぶん]),
  - Z_5 (夏至 [げし]),
  - Z_8 (秋分 [しゅうぶん]) et
  - Z_{11} (冬至 [とうじ]);
- beginnings of Chinese seasons:
  - J_1 (立春 [りっしゅん]),
  - J_4 (立夏 [りっか]),
  - J_7 (立秋 [りっしゅう]) et
  - J_{10} (立冬 [りっとう]);
- two of the *jié qì* are Chinese festivals:
  - J_3 (清明, Qīng míng, [せいめい], clear and bright) and
  - Z_{11} (冬至, Dōng zhì, [とうじ], Winter solstice).

♫ Song of the "jié qì" (節氣歌, jié qì gē) ♫

The following song helps memorize the jié qì...

春雨驚春清穀天	chūn yǔ jīng chūn qīng gǔ tiān,	♪
夏滿芒夏暑相連	xià mǎn máng xià shǔ xiāng lián,	♩
秋處露秋寒霜降	qiū chù lù qiū hán shuāng jiàng,	𝅗𝅥
冬雪雪冬小大寒	dōng xuě xuě dōng xiǎo dà hán.	𝅝
每月兩節不變更	měi yuè liǎng jié bù biàn gēng,	♫
最多相差一兩天	zùi duō xiāng chā yī liǎng tiān	♩
上半年來六、廿一	shàng bàn nián lái liù, niàn yī	♪
下半年是八、廿三	xià bàn nián shì bā, niàn sān	♩

The 24 せっき: observations

- In Japan, the word Setsubun (節分) originally meant the eves of
  - Risshun (立春, 315°, start of Spring),
  - Rikka (立夏, 45°, start of Summer),
  - Risshū (立秋, 135°, start of Fall) and of
  - Rittō (立冬, 225°, start of Winter).
- Currently, it mainly refers to the day before Risshun (around February 4).

Solar months in Japan

The twelve せつ do also define "solar calendar months." The first month starts at point J_1. Each Japanese season contains three months, named as follows (the names of the seasons are shun, ka, shū and tō, and mō = ..., chū = ..., ki = ...):

#	month	ひらがな	starts at	
1	孟春	もうしゅん (mōshun)	J_1	≈ February 4
2	仲春	ちゅうしゅん (chūshun)	J_2	≈ March 6
3	季春	きしゅん (kishun)	J_3	≈ April 5
4	孟夏	もうか (mōka)	J_4	≈ May 6
5	仲夏	ちゅうか (chūka)	J_5	≈ June 6
6	季夏	きか (kika)	J_6	≈ July 7
7	孟秋	もうしゅう (mōshū)	J_7	≈ August 8
8	中秋 or 仲秋	ちゅうしゅう (chūshū)	J_8	≈ September 8
9	季秋	きしゅう (kishū)	J_9	≈ October 8
10	孟冬	もうとう (mōtō)	J_{10}	≈ November 8
11	仲冬	ちゅうとう (chūtō)	J_{11}	≈ December 7
12	季冬	きとう (kitō)	J_{12}	≈ January 6

The pentads (候, hou, [こう])

- each solar term is also divided in three pentads (候, hou, [こう]);
- the first pentad is 初候, the second is 次候, and the last is 末候;
- each pentad is made of five days (sometimes six) and there are exactly 72 pentads in a year;
- average duration of a pentad: $\frac{365.2422}{72} \approx 5.07\ldots$ d;
- each pentad has a name.

The Chinese solar calendar (cont'd)

How are the jié qìs computed?

- before the 1645 reform, the mean Sun (平氣, píng qì) was used;
- with the mean Sun, the time from one jié qì to the next one was constant ($\frac{365.2422}{24} \approx 15.22$ days);
- since 1645, the true Sun (定氣, dìng qì) is used, and it requires a more complex computation;
- with the true Sun, the angle from one jié qì to the next one is constant (15°);

The Chinese solar calendar (cont'd)

How are the jié qìs computed? (cont'd)

- first, the exact astronomical instants of the 24 terms are determined in UT (Universal Time); they corresponds to the instants when the solar longitude is a multiple of 15°;
- the accuracy of the determination depends on the astronomical theory used, which has varied during the history of China;
- since 1929, the various dates are expressed in the time of the 120° E meridian (slightly East of 北京, Běijīng) and these dates are used.

The Chinese solar calendar (cont'd)

Influence of the reference meridian

The meridian (120° E, 8 hours East of Greenwich) plays a role:

1. the 2007 Winter solstice occurred on December 22, 2007 at 6:07 UT, hence at 14:07 on the same day, hour of the 120° E meridian:

   Start of suì (歲) on December 22, 2007;

2. the 2008 Winter solstice occurred on December 21, 2008 at 12:03 UT, hence at 20:03 on the same day, hour of the 120° E meridian:

   Start of suì (歲) on December 21, 2008;

3. the 2009 Winter solstice occurred on December 21, 2009 at 17:46 UT, hence at 1:46 the next day, hour of the 120° E meridian: Start of suì (歲) on December 22, 2009.

The Chinese solar calendar: the age

- nowadays, the word 歲 (suì) is only used when speaking of a person's age;
- each traversed year counts for 1:
  - a child born 5 days before the end of the year is one year old when it is born,
  - at the start of the following year, he/she is already two years old;
- beginning of the year of the ages:
  - traditionally, the Chinese used to count their age from the Winter solstice;
  - many Chinese now count it from the Chinese New Year (lunisolar calendar), or from the 7th day of the new year.

The Chinese solar calendar: weddings ...

A 年 can be located in four different ways with respect to the *Lì chūn* (J_1) points (start of Chinese Spring, around February 4):

1. a 年 may contain no *Lì chūn* point: it is called 無春年 (no Spring year). It is also called 寡婦年 (widow year) in northern China or 盲年 ((doubly) blind year) in southern China ⇒ bad luck for marriage;
2. a 年 may contain two *Lì chūn* points: doubly bright year ⇒ doubly favorable year for marriages;
3. a 年 may contain only the final *Lì chūn* point: blind year;
4. le 年 may contain only the initial *Lì chūn* point: bright year.

The Chinese solar calendar (cont'd)

(Simplified) summary of the computation (Meeus 1991)

- the jié qìs (節氣) correspond to a determined solar longitude (0°, 15°, 30°, etc.);

The Chinese solar calendar (cont'd)

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- the jié qìs (節氣) correspond to a determined solar longitude (0°, 15°, 30°, etc.);
- the mean solar longitude L_0 at instant T (T in Julian centuries since January 1.5, 2000) can be computed with:

$$L_0 = 280°.46645 + 36000°.76983\,T + 0.0003032\,T^2$$

The Chinese solar calendar (cont'd)

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- a correction term C (the equation of the center) is then added, in order to take into account the (quasi) elliptic orbit of the Earth:

$$L = L_0 + C$$

The Chinese solar calendar (cont'd)

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$$L = L_0 + C$$

- the final computation amounts to finding T knowing L, which can be done using approximation methods (dichotomy, ...).

The Chinese lunar calendar

Lunar months

The 年 (nián) calendar contains lunar months:

- the *average* length of a lunar month is 29.530589 days (29 d 12 h 44 mn 3 s);

The Chinese lunar calendar

Lunar months

The 年 (nián) calendar contains lunar months:

- the *average* length of a lunar month is 29.530589 days (29 d 12 h 44 mn 3 s);
- the day a New Moon (新月, xīn yuè, [しんげつ]) occurs, converted into the time of meridian 120° E, defines the start of a lunar month;

The Chinese lunar calendar

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- months have 29 (小月, xiǎo yuè, [小の月, しょうのつき]) or 30 (大月, dà yuè, [大の月, だいのつき]) days, with slightly more months of 30 days, because 29.53... > 29.5;

The Chinese lunar calendar

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- there may be two long months in a row (連大, lián dà);

The Chinese lunar calendar

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- there may be two long months in a row (連大, lián dà);
- before 619 (Táng (唐) dynasty), the mean Moon (平朔, píng shuò) was used, instead of the true Moon (定朔, dìng shuò).

The Chinese lunar calendar

Lunar months (cont'd)

- the actual time between two New Moons can differ by several hours from the average lunar month:
  - during the Winter, lunar months tend to be longer, because of the faster apparent motion of the Sun (which is closer in Winter than in Summer);
  - in Summer, it is the opposite.

The Chinese lunar calendar

Influence of the reference meridian

As for the jié qìs (節氣), the meridian 120° E (8 hours East of Greenwich) plays a role:

1. on March 7, 2008, there was a New Moon (新月, [しんげつ]) at 17:14 UT, hence at 1:14 in the morning of March 8, hour of the 120° E meridian;

   Start of month 2 on March 8;

2. on April 6, 2008, there was a New Moon (新月, [しんげつ]) at 3:55 UT, hence at 11:55 in the morning of April 6, hour of the 120° E meridian;

   Start of month 3 on April 6.

The Chinese lunar calendar

Imbrication of the lunar months in the 歲 (suì)

When the lunar months are imbricated inside the 歲 (suì), two cases are possible:

1. the ca. 11 days that the 歲 (suì) is in excess over twelve lunar months surround these twelve months, for instance:

365 days (歲)		
4 days	354 days (12 months)	7 days

The Chinese lunar calendar

Imbrication of the lunar months in the 歲 (suì)

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1. the ca. 11 days that the 歲 (suì) is in excess over twelve lunar months surround these twelve months, for instance:

365 days (歲)		
4 days	354 days (12 months)	7 days

2. there are only eleven full months inside a 歲 (suì), plus ca. 40 jours, for instance:

365 days (歲)		
15 days	325 days (11 months)	25 days

The Chinese lunar calendar

Definition of New Year and of the embolismic 歲 (suì)

- lunar months are numbered from 1 to 12, one of the months being possibly duplicated;
- by definition (since 256 B.C.), the month in which the Winter solstice (冬至) falls is always month 11; caution: this is not sufficient to determine month 1 and New Year in retrospect;
- let M_0 be the Winter solstice (冬至) month in a given year, and let M_1 be the Winter solstice (冬至) month of the following year; the 歲 (suì) corresponding to that interval is embolismic if there are 12 complete months between M_0 and M_1, these two months being excluded from the count. (This is the first case of the previous view.)

The Chinese lunar calendar

Intervals between zhōng qì (中氣) and length of lunar months

- before 1645 (calendars based on the mean Sun, 平氣):
  - the zhōng qì (中氣) were separated by about 30.44 days;
  - a lunar month (about 29.53 days) contained either one zhōng qì (中氣), or none;
- since 1645 (calendars based on the true Sun, 定氣):
  - the time between two zhōng qì (中氣) varies between 29.44 and 31.44 days;
  - hence, it may also happen that a lunar month contains two zhōng qì (中氣);
  - this phenomenon is made more frequent, because in Winter there is both a shorter interval between the zhōng qìs (中氣) and the lunar months are longer.

The Chinese lunar calendar

Definition of the leap (embolismic) month

- let H_i be a Winter solstice, M_i the (11th) lunar month containing it and let M_{i+1} be the month containing the solstice H_{i+1};
- if the suì starting with M_i, and including all the following months except M_{i+1}, is embolismic, it contains 13 months;
- since there are only 12 zhōng qì (中氣) from H_i (inclusive) to H_{i+1} (exclusive), there is necessarily a month without a zhōng qì (中氣);
- by definition, the leap month (閏月, rùn yuè) is the first month without a zhōng qì (中氣) (rule dating back to the 104 B.C. reform); it is assigned the same number as the previous month;
- note: since there can be months with two zhōng qìs (中氣), it follows that an embolismic suì can contain several (non consecutive) months without zhōng qìs (中氣).

The Chinese lunar calendar

Leap month

- any of the 12 normal months can be followed by a leap month (閏月) [うるうつき];
- since 1645, there has never been a leap month after the months 11, 12 or 1, but it will happen more and more often;
- in 2033, there will for the first time be a leap month after the 11th month, a fact which seems to have been discovered only around 1990;
- month 1 will be duplicated in 2262 and month 12 in 3358 (according to Aslaksen);
- month 12 was already duplicated in the Japanese calendar in 1890, but not in the Chinese calendar.

The Chinese lunar calendar

Summary

- knowing the dates of the solstices and New Moons, we determine if the suì (歲) starting at the time of a Winter solstice (冬至) is common (12 months) or embolismic (13 months);
- if it is embolismic, we look for the first month after the Winter solstice (冬至) and containing no zhōng qìs (中氣);
- by definition, this month is the leap month (閏月);
- this procedure is repeated for every year.

The Chinese lunar calendar

Lunar year (nián)

A nián (年) can have twelve or thirteen lunar months and 353, 354, 355 days (common years) or 383, 384 or 385 days (embolismic years).
Over a span of 200 years from 1911 to 2110, the length distribution is the following:

length	353	354	355	383	384	385
number	1	84	41	5	66	3

We have $\frac{5+66+3}{200} \approx \frac{7}{19}$: ca. 7 years out of 19 are embolismic years.

Chinese calendar: 2008 example

2008(闰)年黄帝纪元4706年戊子(鼠)年

January 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 廿三	2 廿四	3 廿五	4 廿六	5 廿七
6 小寒	7 廿九	8 十二月	9 初二	10 初三	11 初四	12 初五
13 初六	14 初七	15 初八	16 初九	17 初十	18 十一	19 十二
20 十三	21 大寒	22 十五	23 十六	24 十七	25 十八	26 十九
27 二十	28 廿一	29 廿二	30 廿三	31 廿四		

February 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 廿五	2 廿六
3 廿七	4 立春	5 廿九	6 三十	7 正月	8 初二	9 初三
10 初四	11 初五	12 初六	13 初七	14 初八	15 初九	16 初十
17 十一	18 十二	19 雨水	20 十四	21 十五	22 十六	23 十七
24 十八	25 十九	26 二十	27 廿一	28 廿二	29 廿三	

March 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 廿四
2 廿五	3 廿六	4 廿七	5 惊蛰	6 廿九	7 三十	8 二月
9 初二	10 初三	11 初四	12 初五	13 初六	14 初七	15 初八
16 初九	17 初十	18 十一	19 十二	20 春分	21 十四	22 十五
23 十六	24 十七	25 十八	26 十九	27 二十	28 廿一	29 廿二
30 廿三	31 廿四					

April 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 廿五	2 廿六	3 廿七	4 清明	5 廿九
6 三月	7 初二	8 初三	9 初四	10 初五	11 初六	12 初七
13 初八	14 初九	15 初十	16 十一	17 十二	18 十三	19 十四
20 谷雨	21 十六	22 十七	23 十八	24 十九	25 二十	26 廿一
27 廿二	28 廿三	29 廿四	30 廿五			

May 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1 廿六	2 廿七	3 廿八
4 廿九	5 立夏	6 四月	7 初三	8 初四	9 初五	10 初六
11 初七	12 初八	13 初九	14 初十	15 十一	16 十二	17 十三
18 十四	19 十五	20 十六	21 小满	22 十八	23 十九	24 二十
25 廿一	26 廿二	27 廿三	28 廿四	29 廿五	30 廿六	31 廿七

June 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 廿八	2 廿九	3 三十	4 五月	5 芒种	6 初三	7 初四
8 初五	9 初六	10 初七	11 初八	12 初九	13 初十	14 十一
15 十二	16 十三	17 十四	18 十五	19 十六	20 十七	21 夏至
22 十九	23 二十	24 廿一	25 廿二	26 廿三	27 廿四	28 廿五
29 廿六	30 廿七					

July 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 廿八	2 廿九	3 六月	4 初二	5 初三
6 初四	7 小暑	8 初六	9 初七	10 初八	11 初九	12 初十
13 十一	14 十二	15 十三	16 十四	17 十五	18 十六	19 十七
20 十八	21 十九	22 大暑	23 廿一	24 廿二	25 廿三	26 廿四
27 廿五	28 廿六	29 廿七	30 廿八	31 廿九		

August 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 七月	2 初二
3 初三	4 初四	5 初五	6 初六	7 立秋	8 初八	9 初九
10 初十	11 十一	12 十二	13 十三	14 十四	15 十五	16 十六
17 十七	18 十八	19 十九	20 二十	21 廿一	22 廿二	23 处暑
24 廿四	25 廿五	26 廿六	27 廿七	28 廿八	29 廿九	30 三十
31 八月						

September 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 初二	2 初三	3 初四	4 初五	5 初六	6 初七
7 白露	8 初九	9 初十	10 十一	11 十二	12 十三	13 十四
14 十五	15 十六	16 十七	17 十八	18 十九	19 二十	20 廿一
21 廿二	22 秋分	23 廿四	24 廿五	25 廿六	26 廿七	27 廿八
28 廿九	29 九月	30 初二				

October 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 初三	2 初四	3 初五	4 初六
5 初七	6 初八	7 初九	8 寒露	9 十一	10 十二	11 十三
12 十四	13 十五	14 十六	15 十七	16 十八	17 十九	18 二十
19 廿一	20 廿二	21 廿三	22 廿四	23 霜降	24 廿六	25 廿七
26 廿八	27 廿九	28 三十	29 十月	30 初二	31 初三	

November 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 初四
2 初五	3 初六	4 初七	5 初八	6 初九	7 立冬	8 十一
9 十二	10 十三	11 十四	12 十五	13 十六	14 十七	15 十八
16 十九	17 二十	18 廿一	19 廿二	20 廿三	21 廿四	22 小雪
23 廿六	24 廿七	25 廿八	26 廿九	27 三十	28 十一月	29 初二
30 初三						

December 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 初四	2 初五	3 初六	4 初七	5 初八	6 初九
7 大雪	8 十一	9 十二	10 十三	11 十四	12 十五	13 十六
14 十七	15 十八	16 十九	17 二十	18 廿一	19 廿二	20 廿三
21 冬至	22 廿五	23 廿六	24 廿七	25 廿八	26 廿九	27 十二月
28 初二	29 初三	30 初四	31 初五			

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请惠顾长期赞助商 http://www.ValueCalling.com/kk/ (鱼油,卵磷脂,精华素,许氏花旗参,脑白金等回国礼品,网上最低价;优质清晰便宜电话卡)

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3/26观音圣诞 4/3寒食 4/4清明 4/5《华夏文摘》创刊17周年 5/11母亲节 5/12 佛祖圣诞 6/5入梅 6/8端午 6/15父亲节
7/18出梅 8/7七夕 8/15中元,盂兰 9/14中秋 9/25秋社 9/26孔子圣诞 10/7重阳 11/12下元 12/21冬至 12/25耶稣圣诞

Chinese calendar: 2008 example (detail)

March 2008

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 廿四
2 廿五	3 廿六	4 廿七	5 惊蛰 J2	6 廿九	7 三十	8 二月
9 初二	10 初三	11 初四	12 初五	13 初六	14 初七	15 初八
16 初九	17 初十	18 十一	19 十二	20 春分 Z2	21 十四	22 十五
23 十六	24 十七	25 十八	26 十九	27 二十	28 廿一	29 廿二
30 廿三	31 廿四					

April 2008

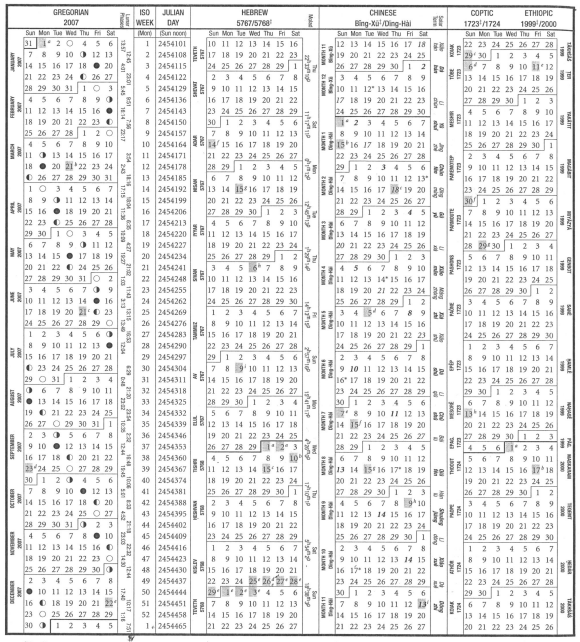
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 廿五	2 廿六	3 廿七	4 清明 J3	5 廿九
6 三月	7 初二	8 初三	9 初四	10 初五	11 初六	12 初七
13 初八	14 初九	15 初十	16 十一	17 十二	18 十三	19 十四
20 谷雨 Z3	21 十六	22 十七	23 十八	24 十九	25 二十	26 廿一
27 廿二	28 廿三	29 廿四	30 廿五			

(note: 初 = beginning, 廿 = 20 in Chinese calendars)

Chinese calendar (中國曆, ちゅうごくれき)

Examples: 2007–2009

2007



*New Year
[a]Spring (0:07)
[b]Summer (18:06)
[c]Autumn (9:51)
[d]Winter (6:07)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

[1]Leap year
[2]New Year
[3]Yom Kippur
[4]Sukkot
[5]Winter starts
[6]Hanukkah
[7]Purim
[8]Passover
[9]Shavuot
[a]Fast of Av

[1]Leap year
[2]New Year (4705, Pig)
[3]Lantern Festival
[4]Qingming
[5]Dragon Festival
[6]Qiqiao
[7]Hungry Ghosts
[8]Mid-Autumn Festival
[9]Double-Ninth Festival
[a]Dongzhi
*Start of 60-name cycle

[1]Leap year
*New Year
[a]Jesus's Circumcision
[b]Building of the Cross
[c]Christmas
[d]Jesus's Circumcision
[e]Epiphany
[f]Easter
[g]Mary's Announcement
[h]Jesus's Transfiguration

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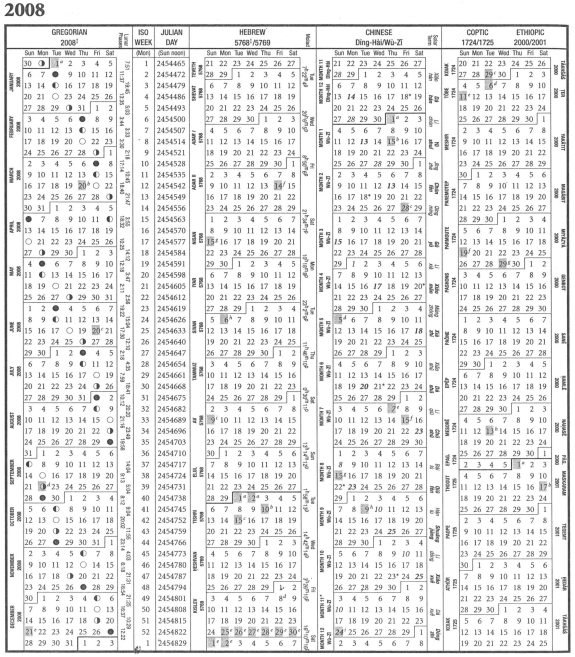
2008



[1]Leap year
*New Year
[a]Spring (5:48)
[b]Summer (23:59)
[c]Autumn (15:44)
[d]Winter (12:03)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

[1]Leap year
*New Year
[a]Yom Kippur
[b]Sukkot
[c]Winter starts
[d]Hanukkah
[e]Purim
[f]Passover
[g]Shavuot
[h]Fast of Av

*New Year (4706, Rat)
[a]Lantern Festival
[b]Qingming
[c]Dragon Festival
[d]Qiqiao
[e]Hungry Ghosts
[f]Mid-Autumn Festival
[g]Double-Ninth Festival
[h]Dongzhi
*Start of 60-name cycle

*New Year
[a]Building of the Cross
[b]Christmas
[c]Jesus's Circumcision
[d]Epiphany
[e]Easter
[f]Mary's Announcement
[g]Jesus's Transfiguration

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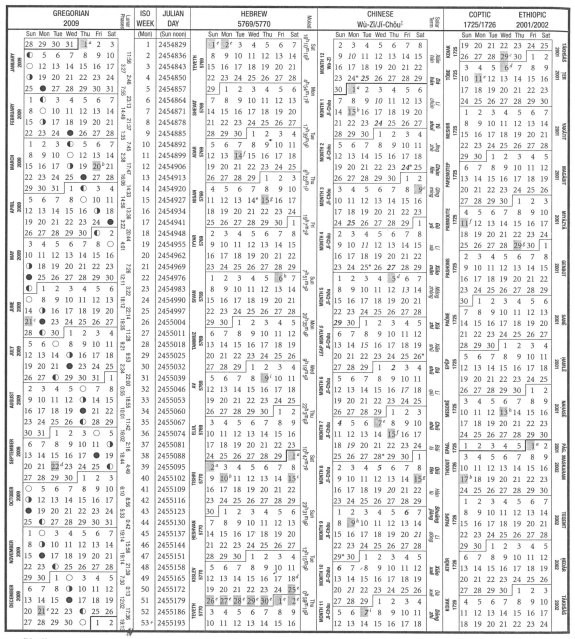
2009



*New Year
[a]Spring (11:43)
[b]Summer (5:45)
[c]Autumn (21:18)
[d]Winter (17:46)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

*New Year
[a]Yom Kippur
[b]Sukkot
[c]Winter starts
[d]Hanukkah
[e]Purim
[f]Passover
[g]Shavuot
[h]Fast of Av
*New solar cycle

[1]Leap year
*New Year (4707, Ox)
[a]Lantern Festival
[b]Qingming
[c]Dragon Festival
[d]Qiqiao
[e]Hungry Ghosts
[f]Mid-Autumn Festival
[g]Double-Ninth Festival
[h]Dongzhi
*Start of 60-name cycle

*New Year
[a]Building of the Cross
[b]Christmas
[c]Jesus's Circumcision
[d]Epiphany
[e]Easter
[f]Mary's Announcement
[g]Jesus's Transfiguration

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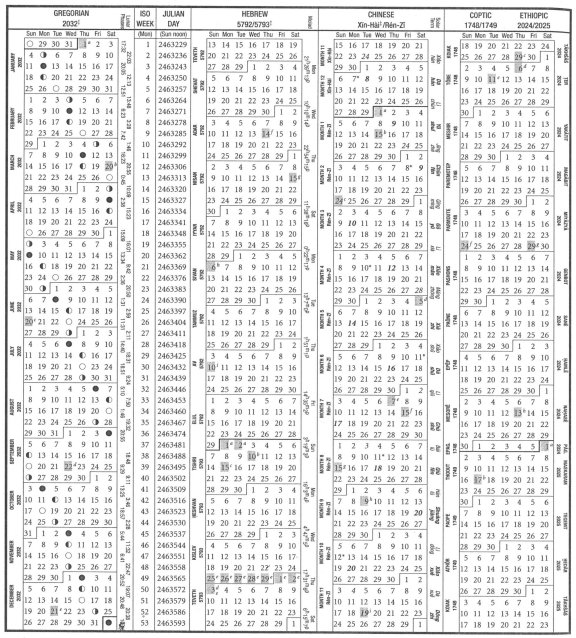
Chinese calendar (中國曆, ちゅうごくれき)

Examples: 2032–2034

2032



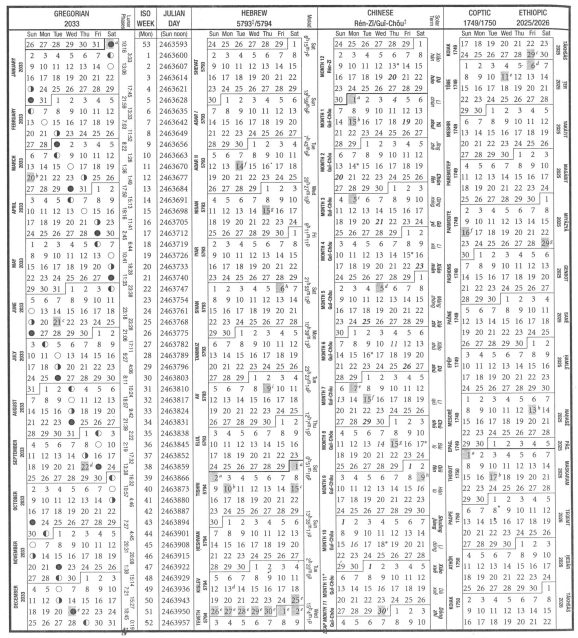
[1] Leap year
[2] New Year
[3] Spring (1:20)
[4] Summer (19:07)
[5] Autumn (11:09)
[6] Winter (7:55)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

[1] Leap year
[2] New Year
[3] Yom Kippur
[4] Sukkot
[5] Winter starts
[6] Hanukkah
[7] Purim
[8] Passover
[9] Shavuot
[10] Fast of Av

[1] Leap year
[2] New Year (4730, Rat)
[3] Lantern Festival
[4] Qingming
[5] Dragon Festival
[6] Qiqiāo
[7] Hungry Ghosts
[8] Mid-Autumn Festival
[9] Double-Ninth Festival
[10] Dōngzhì
*Start of 60-name cycle

[a] New Year
[b] Building of the Cross
[c] Christmas
[d] Jesus's Circumcision
[e] Epiphany
[f] Easter
[g] Mary's Announcement
[h] Jesus's Transfiguration

2033



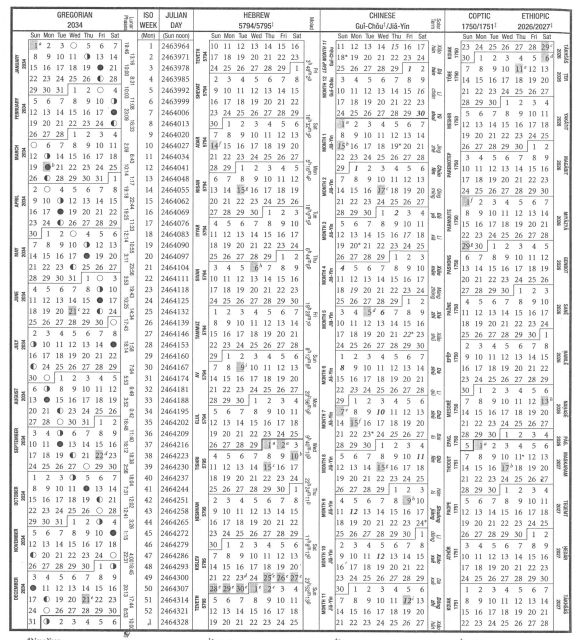
*New Year
[1] Spring (7:21)
[2] Summer (1:00)
[3] Autumn (16:51)
[4] Winter (13:44)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

[1] Leap year
[2] New Year
[3] Yom Kippur
[4] Sukkot
[5] Winter starts
[6] Hanukkah
[7] Purim
[8] Passover
[9] Shavuot
[10] Fast of Av

[1] Leap year
[2] New Year (4731, Ox)
[3] Lantern Festival
[4] Qingming
[5] Dragon Festival
[6] Qiqiāo
[7] Hungry Ghosts
[8] Mid-Autumn Festival
[9] Double-Ninth Festival
[10] Dōngzhì
*Start of 60-name cycle

*New Year
[a] Building of the Cross
[b] Christmas
[c] Jesus's Circumcision
[d] Epiphany
[e] Easter
[f] Mary's Announcement
[g] Jesus's Transfiguration

2034



*New Year
[1] Spring (13:16)
[2] Summer (6:43)
[3] Autumn (22:38)
[4] Winter (19:32)
● New moon
◐ First quarter moon
○ Full moon
◑ Last quarter moon

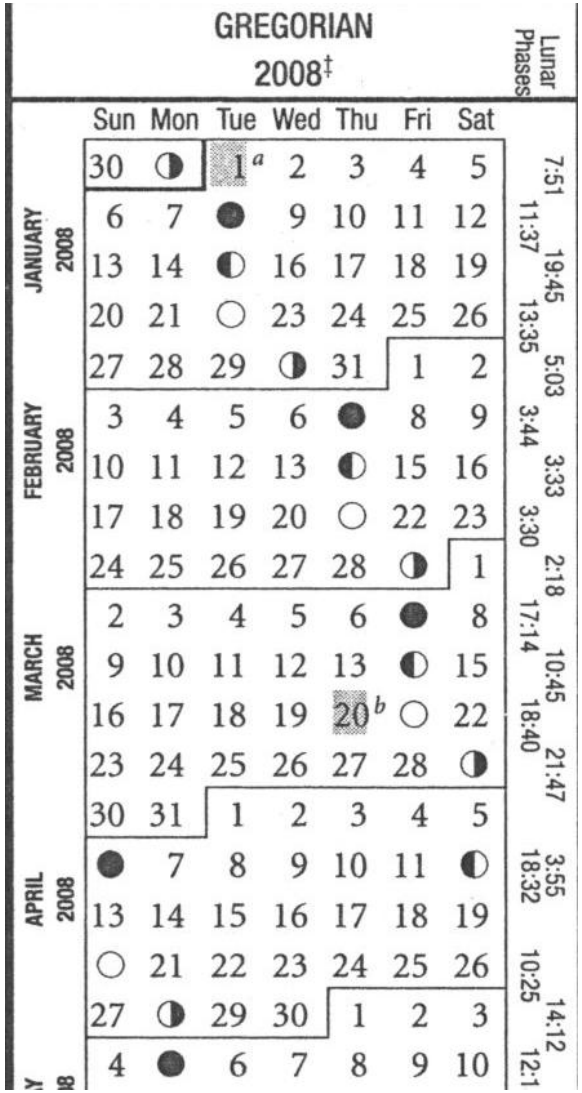
[1] Leap year
[2] New Year
[3] Yom Kippur
[4] Sukkot
[5] Winter starts
[6] Hanukkah
[7] Purim
[8] Passover
[9] Shavuot
[10] Fast of Av

[1] Leap year
[2] New Year (4732, Tiger)
[3] Lantern Festival
[4] Qingming
[5] Dragon Festival
[6] Qiqiāo
[7] Hungry Ghosts
[8] Mid-Autumn Festival
[9] Double-Ninth Festival
[10] Dōngzhì
*Start of 60-name cycle

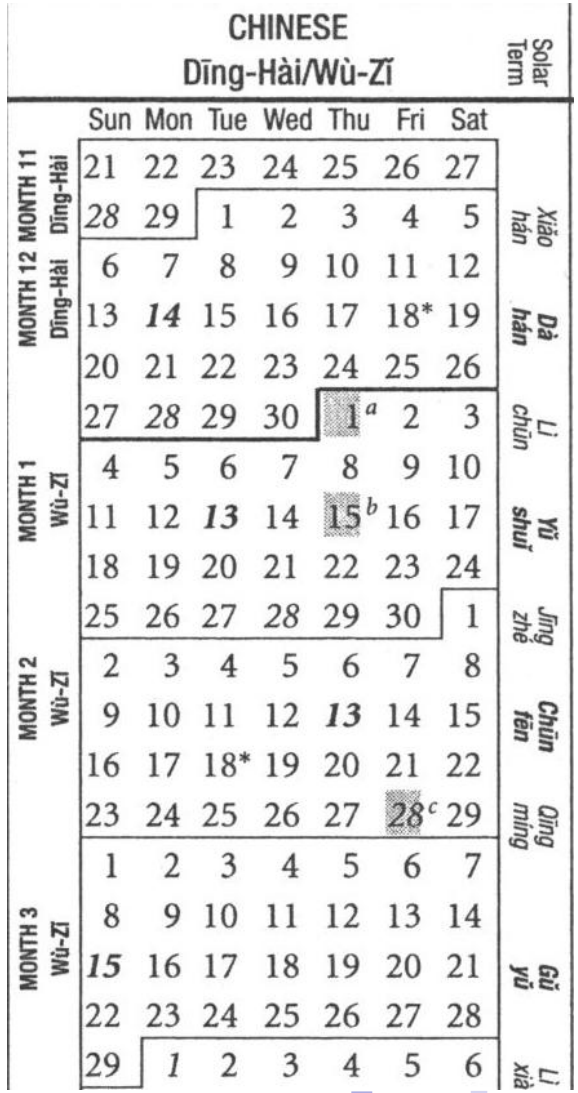
[1] Leap year
[2] New Year
[3] Building of the Cross
[4] Christmas
[5] Jesus's Circumcision
[6] Epiphany
[7] Easter
[8] Mary's Announcement
[9] Jesus's Transfiguration

Chinese calendar (中國曆, ちゅうごくれき)

2008 detail



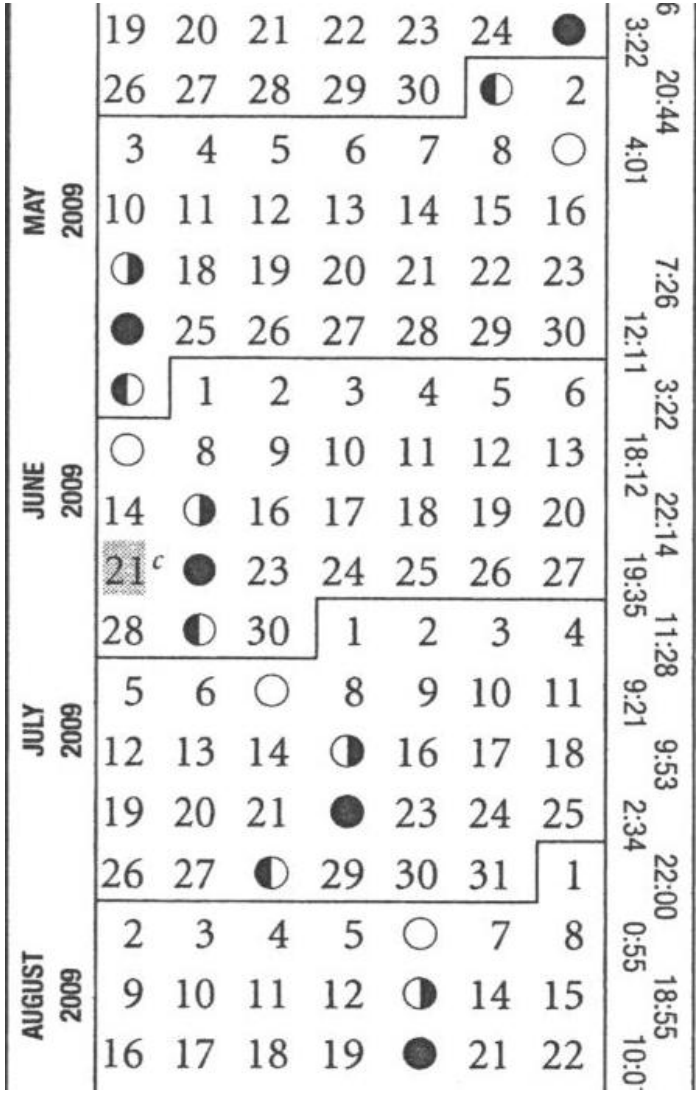
GREGORIAN 2008‡							Lunar Phases
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
JANUARY 2008	30	◑	1[a]	2	3	4	5	7:51
	6	7	●	9	10	11	12	11:37
	13	14	◐	16	17	18	19	19:45
	20	21	○	23	24	25	26	13:35
	27	28	29	◑	31	1	2	5:03
FEBRUARY 2008	3	4	5	6	●	8	9	3:44
	10	11	12	13	◐	15	16	3:33
	17	18	19	20	○	22	23	3:30
	24	25	26	27	28	◑	1	2:18
MARCH 2008	2	3	4	5	6	●	8	17:14
	9	10	11	12	13	◐	15	10:45
	16	17	18	19	20[b]	○	22	18:40
	23	24	25	26	27	28	◑	21:47
	30	31	1	2	3	4	5	
APRIL 2008	●	7	8	9	10	11	◐	3:55
	13	14	15	16	17	18	19	18:32
	○	21	22	23	24	25	26	10:25
	27	◑	29	30	1	2	3	14:12
	4	●	6	7	8	9	10	12:1



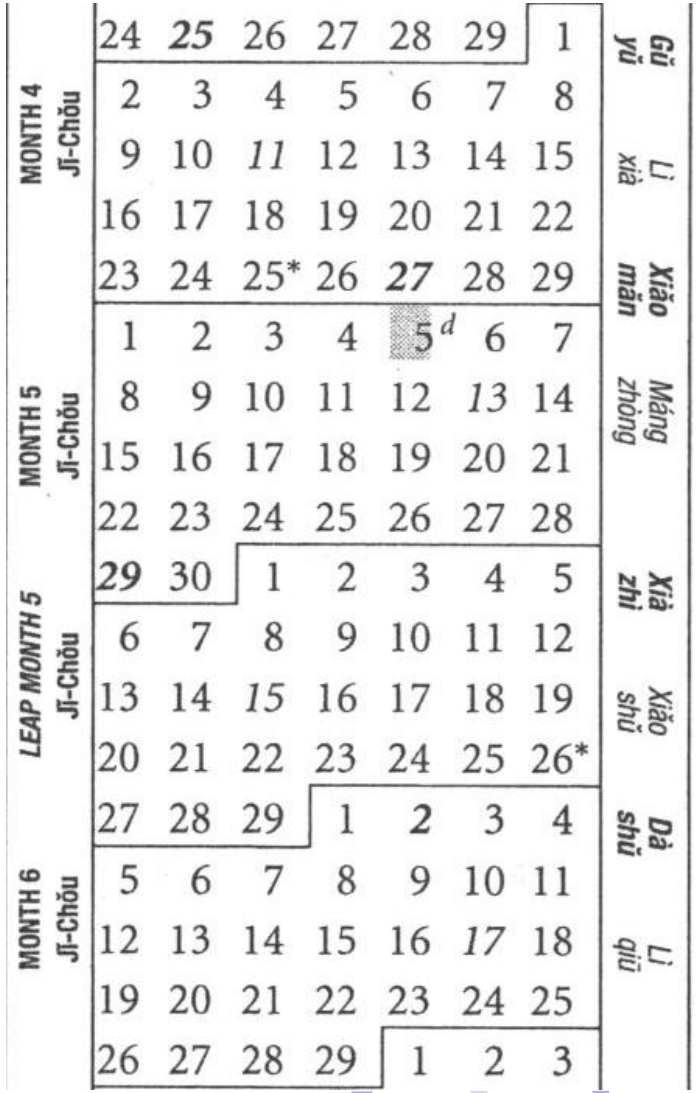
CHINESE Dīng-Hài/Wù-Zǐ								Solar Term
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
MONTH 12 Dīng-Hài	21	22	23	24	25	26	27	*Xiǎo hán*
	28	29	1	2	3	4	5	
	6	7	8	9	10	11	12	***Dà hán***
	13	***14***	15	16	17	18*	19	
	20	21	22	23	24	25	26	
MONTH 1 Wù-Zǐ	27	*28*	29	30	1[a]	2	3	*Lì chūn*
	4	5	6	7	8	9	10	
	11	12	***13***	14	15[b]	16	17	***Yǔ shuǐ***
	18	19	20	21	22	23	24	
	25	26	27	*28*	29	30	1	*Jīng zhé*
MONTH 2 Wù-Zǐ	2	3	4	5	6	7	8	
	9	10	11	12	***13***	14	15	***Chūn fēn***
	16	17	18*	19	20	21	22	
	23	24	25	26	27	28[c]	29	*Qīng míng*
MONTH 3 Wù-Zǐ	1	2	3	4	5	6	7	
	8	9	10	11	12	13	14	
	15	16	17	18	19	20	21	***Gǔ yǔ***
	22	23	24	25	26	27	28	
	29	*1*	2	3	4	5	6	*Lì xià*

Chinese calendar (中國曆, ちゅうごくれき)

2009 detail



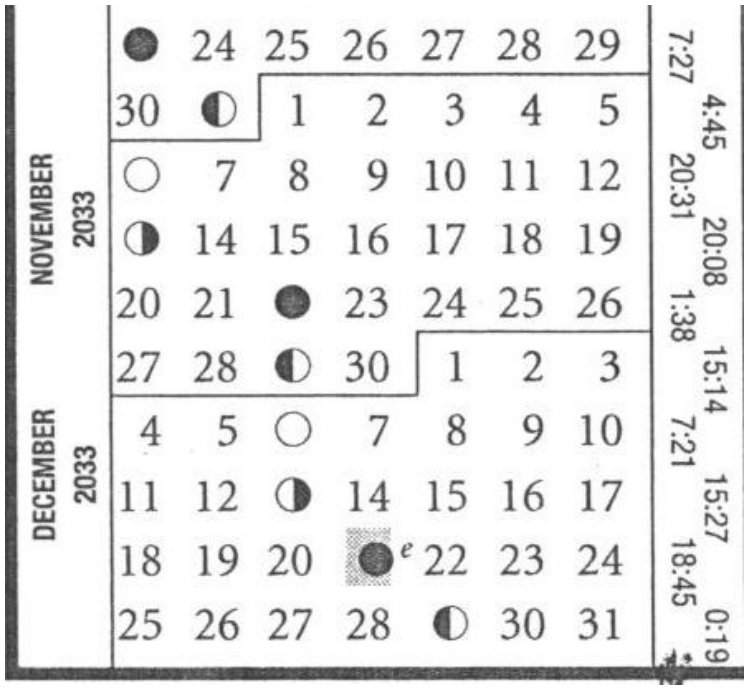
MAY 2009	19	20	21	22	23	24	●	6 3:22
	26	27	28	29	30	◐	2	20:44
	3	4	5	6	7	8	○	4:01
	10	11	12	13	14	15	16	
	◑	18	19	20	21	22	23	7:26
	●	25	26	27	28	29	30	12:11
JUNE 2009	◐	1	2	3	4	5	6	3:22
	○	8	9	10	11	12	13	18:12
	14	◑	16	17	18	19	20	22:14
	21 *c*	●	23	24	25	26	27	19:35
	28	◐	30	1	2	3	4	11:28
JULY 2009	5	6	○	8	9	10	11	9:21
	12	13	14	◑	16	17	18	9:53
	19	20	21	●	23	24	25	2:34
	26	27	◐	29	30	31	1	22:00
AUGUST 2009	2	3	4	5	○	7	8	0:55
	9	10	11	12	◑	14	15	18:55
	16	17	18	19	●	21	22	10:0



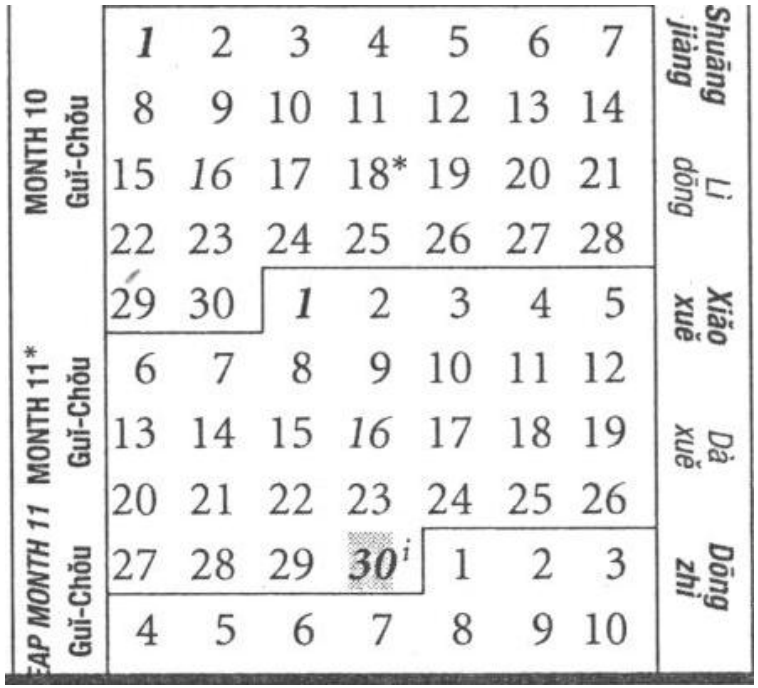
MONTH 4 Jǐ-Chǒu	24	***25***	26	27	28	29	1	*Gǔ yǔ*
	2	3	4	5	6	7	8	
	9	10	*11*	12	13	14	15	*Lì xià*
	16	17	18	19	20	21	22	
	23	24	25*	26	***27***	28	29	*Xiǎo mǎn*
MONTH 5 Jǐ-Chǒu	1	2	3	4	5 *d*	6	7	
	8	9	10	11	12	*13*	14	*Máng zhòng*
	15	16	17	18	19	20	21	
	22	23	24	25	26	27	28	
LEAP MONTH 5 Jǐ-Chǒu	***29***	30	1	2	3	4	5	*Xià zhì*
	6	7	8	9	10	11	12	
	13	14	*15*	16	17	18	19	*Xiǎo shǔ*
	20	21	22	23	24	25	26*	
MONTH 6 Jǐ-Chǒu	27	28	29	1	***2***	3	4	*Dà shǔ*
	5	6	7	8	9	10	11	
	12	13	14	15	16	*17*	18	*Lì qiū*
	19	20	21	22	23	24	25	
	26	27	28	29	1	2	3	

Chinese calendar (中國曆, ちゅうごくれき)

2033 detail



NOVEMBER 2033	●	24	25	26	27	28	29	7:27
	30	◐	1	2	3	4	5	4:45
	○	7	8	9	10	11	12	20:31
	◑	14	15	16	17	18	19	20:08
	20	21	●	23	24	25	26	1:38
	27	28	◐	30	1	2	3	15:14
DECEMBER 2033	4	5	○	7	8	9	10	7:21
	11	12	◑	14	15	16	17	15:27
	18	19	20	●[e]	22	23	24	18:45
	25	26	27	28	◐	30	31	0:19

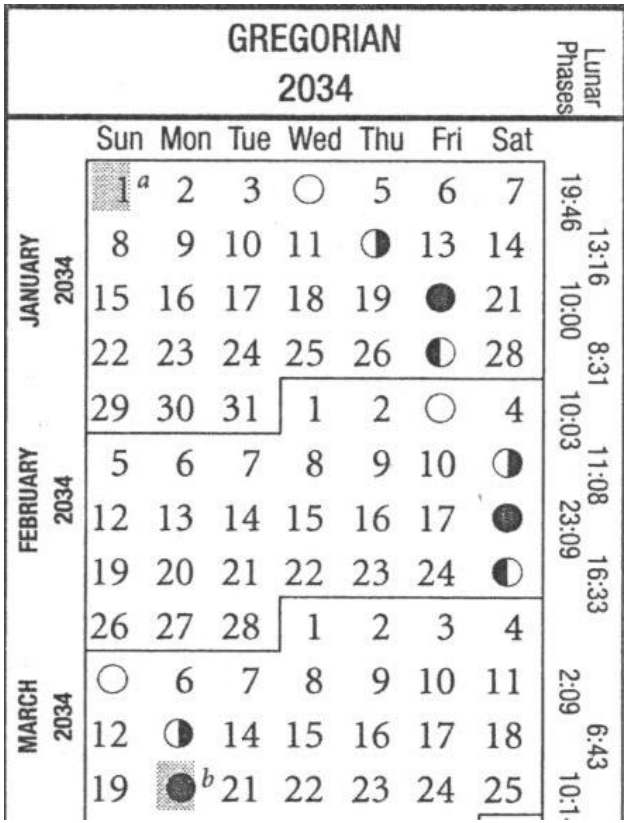


		1	2	3	4	5	6	7
MONTH 10 Guǐ-Chǒu		8	9	10	11	12	13	14
		15	*16*	17	18*	19	20	21
		22	23	24	25	26	27	28
		29	30	*1*	2	3	4	5
MONTH 11* Guǐ-Chǒu		6	7	8	9	10	11	12
		13	14	15	*16*	17	18	19
		20	21	22	23	24	25	26
EAP MONTH 11 Guǐ-Chǒu		27	28	29	*30*[i]	1	2	3
		4	5	6	7	8	9	10

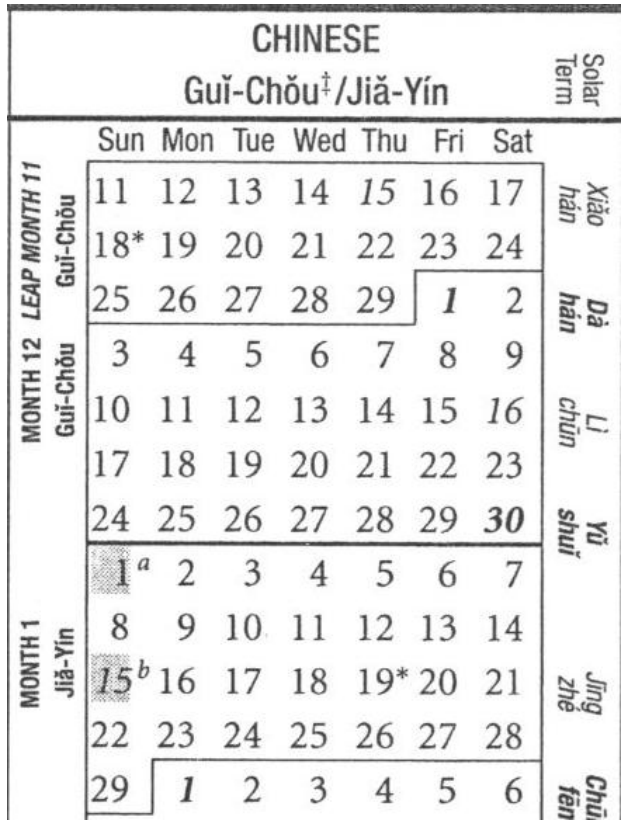
Shuāng jiàng	Lì dōng	Xiǎo xuě	Dà xuě	Dōng zhì

Chinese calendar (中國曆, ちゅうごくれき)

2034 detail



GREGORIAN 2034								Lunar Phases
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
JANUARY 2034	1[a]	2	3	○	5	6	7	19:46
	8	9	10	11	◑	13	14	13:16
	15	16	17	18	19	●	21	10:00
	22	23	24	25	26	◐	28	8:31
	29	30	31	1	2	○	4	10:03
FEBRUARY 2034	5	6	7	8	9	10	◑	11:08
	12	13	14	15	16	17	●	23:09
	19	20	21	22	23	24	◐	16:33
	26	27	28	1	2	3	4	
MARCH 2034	○	6	7	8	9	10	11	2:09
	12	◑	14	15	16	17	18	6:43
	19	●[b]	21	22	23	24	25	10:1



CHINESE Guǐ-Chǒu‡/Jiǎ-Yín								Solar Term
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
MONTH 12 LEAP MONTH 11 Guǐ-Chǒu	11	12	13	14	*15*	16	17	*Xiǎo hán*
	18*	19	20	21	22	23	24	
	25	26	27	28	29	***1***	2	***Dà hán***
	3	4	5	6	7	8	9	
	10	11	12	13	14	15	*16*	*Lì chūn*
	17	18	19	20	21	22	23	
	24	25	26	27	28	29	***30***	***Yǔ shuǐ***
MONTH 1 Jiǎ-Yín	1[a]	2	3	4	5	6	7	
	8	9	10	11	12	13	14	
	15[b]	16	17	18	19*	20	21	*Jīng zhé*
	22	23	24	25	26	27	28	
	29	***1***	2	3	4	5	6	***Chūn fēn***

The Chinese lunar calendar (cont'd)

(Simplified) summary of the computation (Meeus 1991)

- the task is to compute the instants of the New Moons (新月, [しんげつ]);

The Chinese lunar calendar (cont'd)

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The Chinese lunar calendar (cont'd)

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- the position of the Sun (which influences the Moon), the position of the Moon with respect to its perigee, as well as various other factors are then taken into account in order to compute a correction term C;
- the true New Moon (新月, [しんげつ]) is given by:

$$J' = J + C$$

The Chinese lunar calendar (cont'd)

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$$J' = J + C$$

- for a precise computation, the very complex motion of the Moon (月) must be taken into account.

Chinese calendar: the cycles

The years are grouped according to different cycles:

- sixty years (sexagenary) cycle (perhaps of Babylonian origin), combination of two sub-cycles:
  - twelve earthly branches (*zhī*, 支) [し];
  - ten celestial stems (*gān*, 干) [かん].
- the sexagenary cycle was originally used for the days, and was also used for the years, after the 1st century C.E.;
- the sixty period could be split into two periods of thirty, or six periods of ten;
- in the 1950s, the ten days period was still used in certain rural areas;
- the seven days week seems only to go back to the Sòng (宋) dynasty (960–1279);

Chinese calendar: the sexagenary cycle

- *Gān* (干) (stems):
  - according to Needham, the *Gān* were probably the names of the days of the primitive 10 days period, and not a combination of the five elements (metal, wood, water, fire, earth) with the Yīn-Yáng ☯ dualism;
  - the ten *Gān* became associated with obscure astrological names at the beginning of the Hàn (漢) (ca. 206 B.C. — 220 C.E.);
- *Zhī* (支) (branches):
  - the twelve *Zhī* had long been serving for the twelve months of the tropical year;
  - they were also used for the compass directions;
- the cycle is also called 甲子 (jiǎ zǐ), after the name of the first year, and Eto (えと) in Japan;
- according to certain researchers, there might be a correspondence between the 22 (10 + 12) *Gān* and *Zhī* signs and the Phoenician alphabet...

Chinese calendar: the ten celestial stems (天干, [じっかん])

Stem (干)	Pinyin	Japanese (on/kun)		☯	Wǔ Xíng (五行)
甲	jiǎ	きのえ	こう	陽	木
乙	yǐ	きのと	おつ	陰	(wood)
丙	bǐng	ひのえ	へい	陽	火
丁	dīng	ひのと	てい	陰	(fire)
戊	wù	つちのえ	ぼ	陽	土
己	jǐ	つちのと	き	陰	(earth)
庚	gēng	かのえ	こう	陽	金
辛	xīn	かのと	しん	陰	(metal)
壬	rén	みずのえ	じん	陽	水
癸	guǐ	みずのと	き	陰	(water)

- the original meanings of the symbols are not all known (甲: shell, 丙: fishtail, etc.);
- nowadays these symbols are used to count, like with A, B, C, etc.

Chinese calendar: the ten celestial stems (天干, [じっかん])

The Japanese names for the stems can also be interpreted as follows (え = elder brother and と = younger brother):

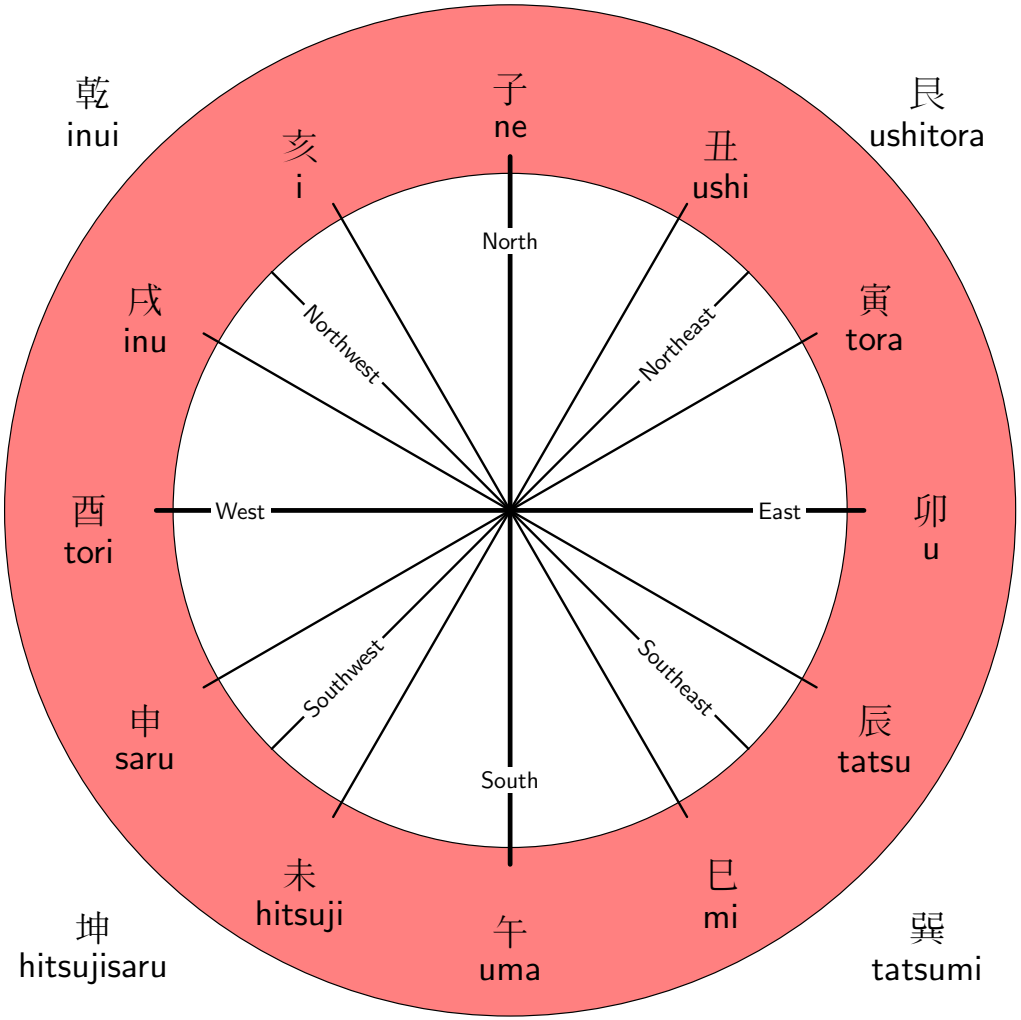
Stem (干)	Japanese	Meaning
甲	きのえ	elder brother of wood (木)
乙	きのと	younger brother of wood (木)
丙	ひのえ	elder brother of fire (火)
丁	ひのと	younger brother of fire (火)
戊	つちのえ	elder brother of earth (土)
己	つちのと	younger brother of earth (土)
庚	かのえ	elder brother of metal (金)
辛	かのと	younger brother of metal (金)
壬	みずのえ	elder brother of water (水)
癸	みずのと	younger brother of water (水)

The 12 earthly branches (地支, [じゅうにし])

Branch (支)	Pinyin	Japanese (on/kun)		Sign
子	zǐ	し	ね	Rat
丑	chǒu	ちゅう	うし	Ox
寅	yín	いん	とら	Tiger
卯	mǎo	ぼう	う	Rabbit
辰	chén	しん	たつ	Dragon
巳	sì	し	み	Snake
午	wǔ	ご	うま	Horse
未	wèi	み	ひつじ	Sheep
申	shēn	しん	さる	Monkey
酉	yǒu	ゆう	とり	Rooster
戌	xū	じゅつ	いぬ	Dog
亥	hài	がい	い	Pig

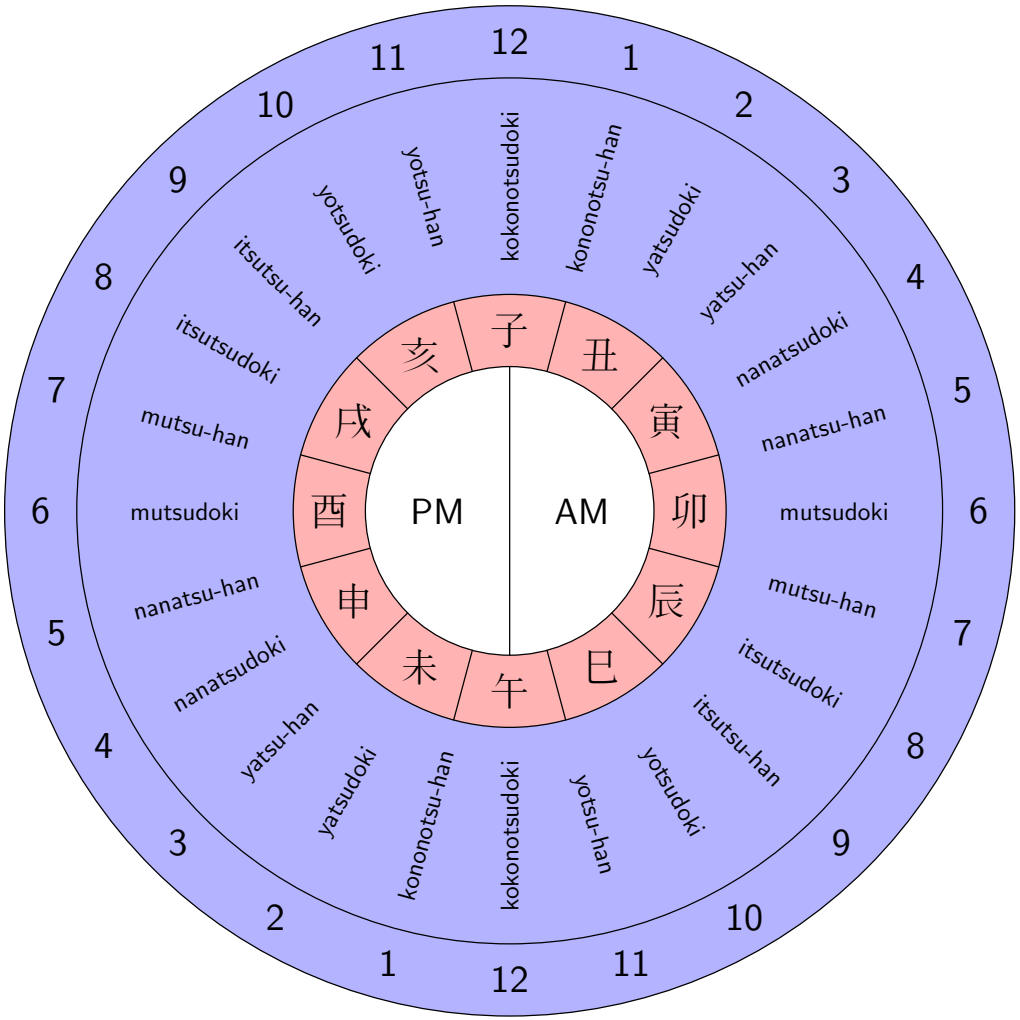
The twelve earthly branches and the directions

Japanese version

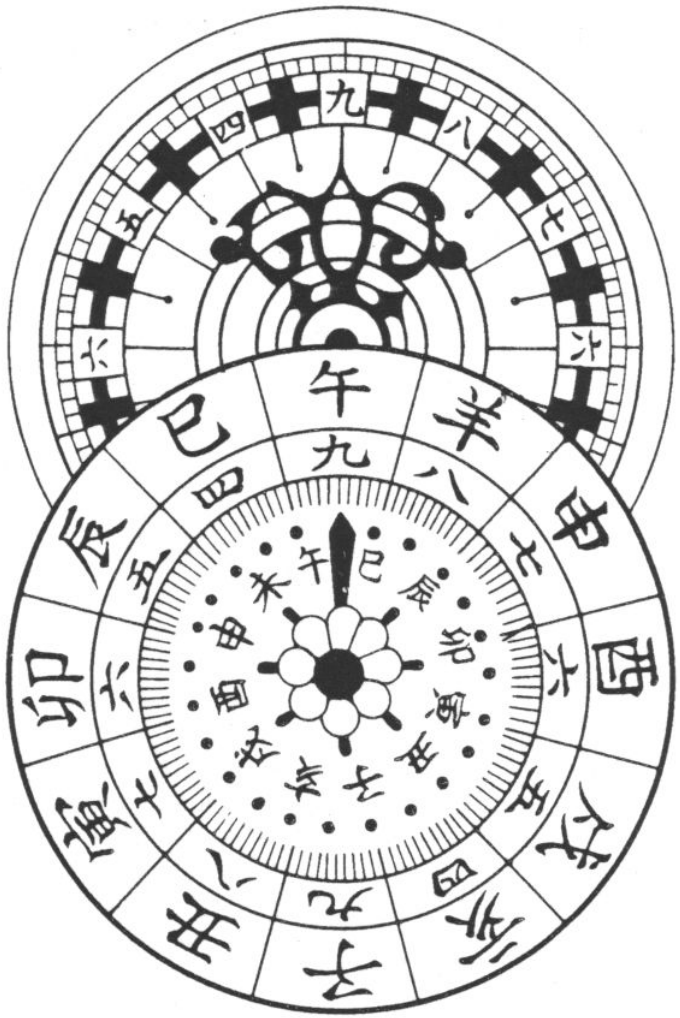


The twelve earthly branches and the hours

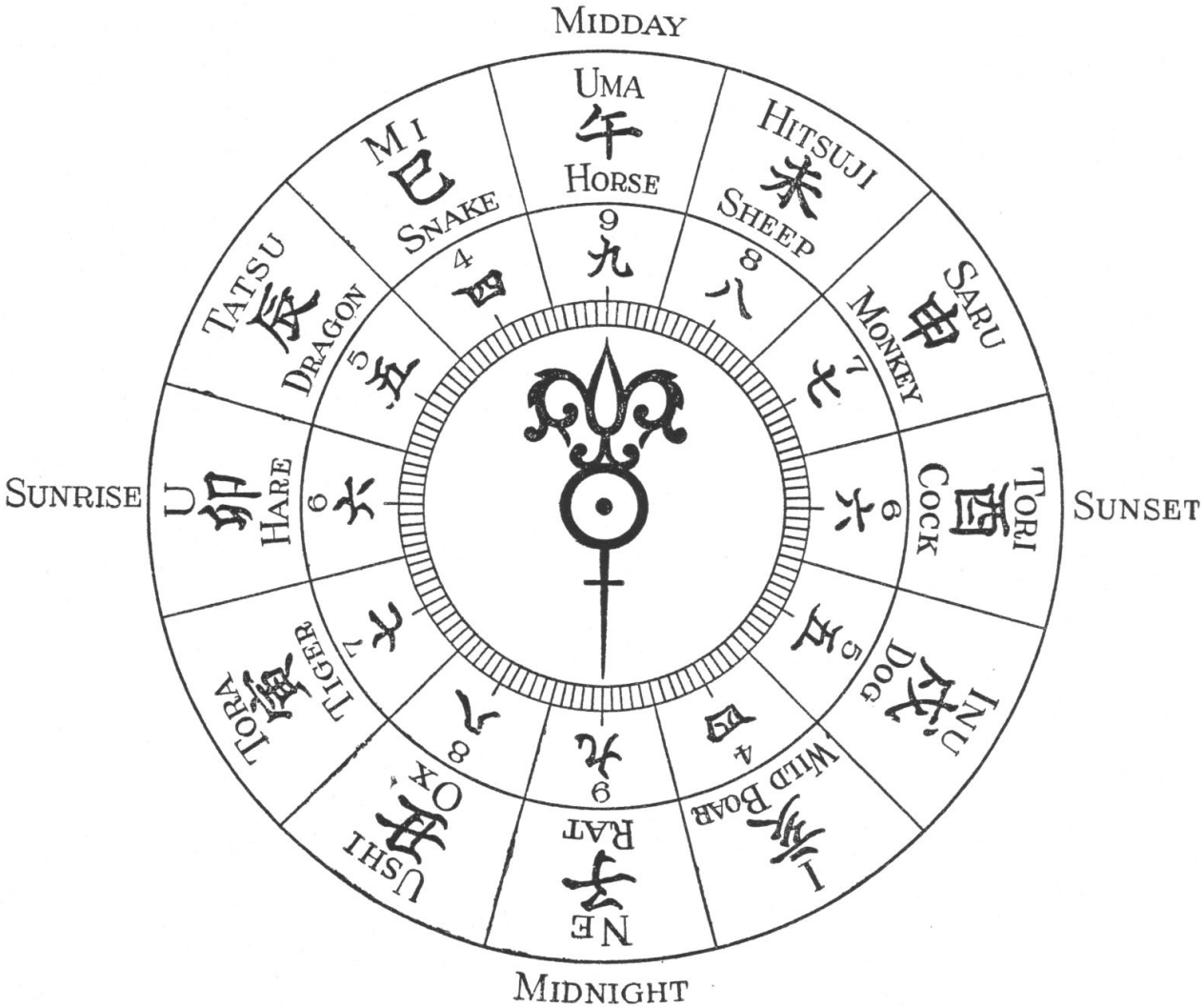
Japanese version



Dial of a Japanese clock (1)



Dial of a Japanese clock (2)



Chinese calendar

Wǔ Xíng (五行): the five elements

五 (wǔ): five
行 (xíng): step

symbol	Pinyin	element	天干 name
木	mù	wood	き
火	huǒ	fire	ひ
土	tǔ	earth	つち
金	jīn	metal	か
水	shuí	water	みず

Japanese Wǔ Xíng

In Japanese, 五行 = ごぎょう.
The Japanese 五行 is also based on five elements, but not on the same ones than the Chinese 五行:

風	ふう	air
空	くう	void
水	すい	water
火	か	fire
地	ち	earth

Chinese calendar

Wŭ Xíng (五行): planets

星 (xīng) = star [せい]
行星 (xíng xīng) = walking star = planet [惑星, わくせい]

Mercury	水星	water star	すいせい
Venus	金星	metal/gold star	きんせい
Mars	火星	fire star	かせい
Jupiter	木星	wood star	もくせい
Saturn	土星	earth star	どせい

Chinese calendar

Wŭ Xíng (五行): weekdays (1)

In the traditional Chinese calendars, the days can be associated to the planets:

Sunday	日曜日	にちようび
Monday	月曜日	げつようび
Tuesday	火曜日	かようび
Wednesday	水曜日	すいようび
Thursday	木曜日	もくようび
Friday	金曜日	きんようび
Saturday	土曜日	どようび

Here, 曜 means "weekday."
The association with the planets is the same as in the West. It probably takes its origins from the Babylonians and Egyptians, via Greece and Rome, but the exact transmission is not known.
This system is no longer much used in China.

Chinese calendar

Wŭ Xíng (五行): weekdays (2)

Japan:

- it seems that the Japanese weekdays were taken from India, through the importation of Bouddhist writings from the 9th century (Kūkai (空海) monk = Kobo Daishi, 弘法大師, 774–835);
- the Japanese astronomers became interested in the astrological work of Bu Kong (不空, Bù Kōng, 705–774), which introduced the planetary names in the calendars;
- at some point, there was a discrepancy which was corrected by the 1685 calendar reform;
- the planetary names have been used for centuries only for astrological purposes, or on rare calendars;
- Japan officially adopted these old names in 1876.

Chinese calendar

The weekdays in China (3)

In China, weekdays (except Sunday) are usually merely numbered from 1 to 6:

Sunday	星期日 星期天	xīng qī rì xīng qí tiān	weekday
Monday	星期一	xīng qī yī	weekday 1
Tuesday	星期二	xīng qī èr	weekday 2
Wednesday	星期三	xīng qī sān	weekday 3
Thursday	星期四	xīng qī sì	weekday 4
Friday	星期五	xīng qī wǔ	weekday 5
Saturday	星期六	xīng qī liù	weekday 6

(Chinese numerals: 一: yī, 二: èr, 三: sān, 四: sì, 五: wǔ, 六: liù, 七: qī, 八: bā, 九: jiǔ, 十: shí)

Chinese calendar

The weekdays in China (4)

Other names exist for the days:

- 周 (zhōu = cycle) can be used: Sunday = 周末 (zhōumò = end of cycle), Monday = 周一 (zhōuyī = first of cycle), etc.; in Japanese: 週 = しゅう, week, same etymology as 周; the week can also be called 週間 (しゅうかん, shūkan);
- Sunday = 禮拜日 ou 禮拜日 (day of prayer), Monday = first day after Sunday, etc.

Chinese calendar: the cycles are combined

		Earthly branches											
		子	丑	寅	卯	辰	巳	午	未	申	酉	戌	亥
Celestial stems	甲	1		51		41		31		21		11	
	乙		2		52		42		32		22		12
	丙	13		3		53		43		33		23	
	丁		14		4		54		44		34		24
	戊	25		15		5		55		45		35	
	己		26		16		6		56		46		36
	庚	37		27		17		7		57		47	
	辛		38		28		18		8		58		48
	壬	49		39		29		19		9		59	
	癸		50		40		30		20		10		60

2008 = beginning of 戊子 (25th year of the cycle)

Chinese calendar

The twelve animals associated to the branches

In a distant past, the division in twelve branches (地支) became associated to a cycle of animals (十二生肖, shí èr shēng xiào) (shēng = to be born, xiào = resemblance):

- rat/mouse (鼠), ox/cow (牛), tiger (虎), rabbit/hare (兔), dragon (龍), snake (蛇), horse (馬), sheep (羊), monkey (猴), rooster (鷄), dog (狗), pig (猪);
- the exact origin of the association is not known with certainty;
- the animals are almost the same in Japan and Korea;
- other countries have slight variations:
  - Viêt-nam: hare $\Longrightarrow$ cat
  - the first month may be different in a different country.

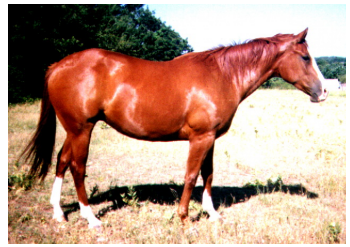
Chinese calendar

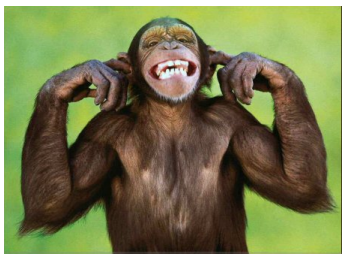
The twelve animals associated to the branches

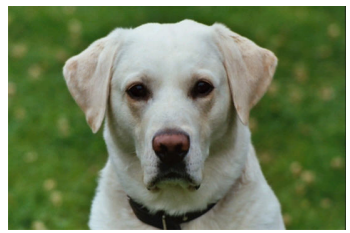













Chinese calendar

Intercalation cycle, *zhāng* (章) cycle

- since 19 solar years are almost equal to 235 lunar months, the intercalation of leap months (embolismic years) almost follows a 19-year cycle;
- this (pseudo-) cycle is called the *zhāng* (章) cycle;
- a Chinese calendar watch patent uses this cycle, or several such cycles, in order to approximate the Chinese calendar over a number of years; there is also a patent for an implementation adapted to phones and PDAs (Shaun Puckrin, 2006);
- other cycles have existed, see Needham;

Chinese calendar

zhāng (章) cycle

Leap months from 1951 to 2045 (5 章):

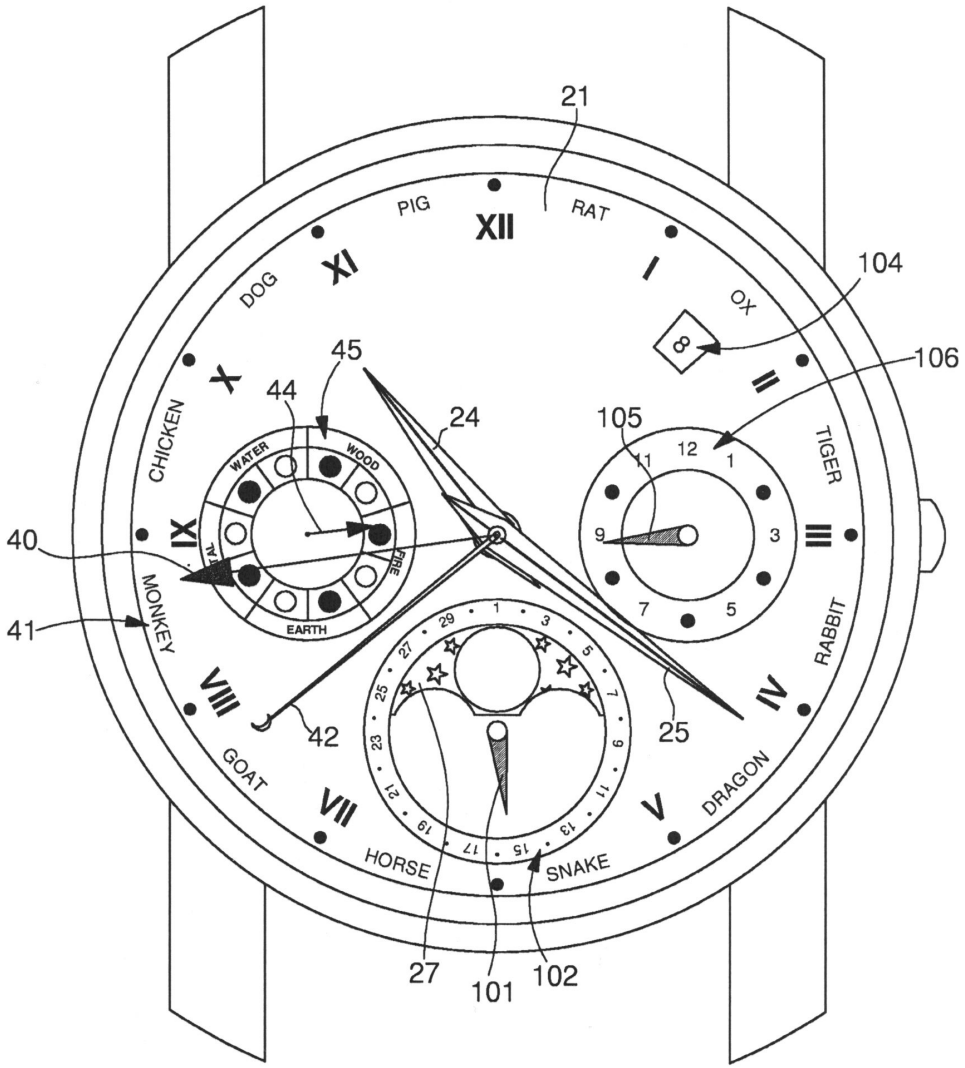
1. 1952 (5), 1955 (3), 1957 (8), 1960 (6), 1963 (4), 1966 (3), 1968 (7);
2. 1971 (5), 1974 (4), 1976 (8), 1979 (6), 1982 (4), 1984 (10), 1987 (6);
3. 1990 (5), 1993 (3), 1995 (8), 1998 (5), 2001 (4), 2004 (2), 2006 (7);
4. 2009 (5), 2012 (4), 2014 (9), 2017 (6), 2020 (4), 2023 (2), 2025 (6);
5. 2028 (5), 2031 (3), 2033 (11), 2036 (6), 2039 (5), 2042 (2), 2044 (7).

- approximatly 7 months are duplicated in 19 years (more or less the same ones from one cycle to the next one)
  $(19 \times 365.2422 \approx 235 \times 29.53\ldots = (12 \times 19 + 7) \times 29.53..)$
- analog to cycles in other calendars (Meton cycle, etc.).

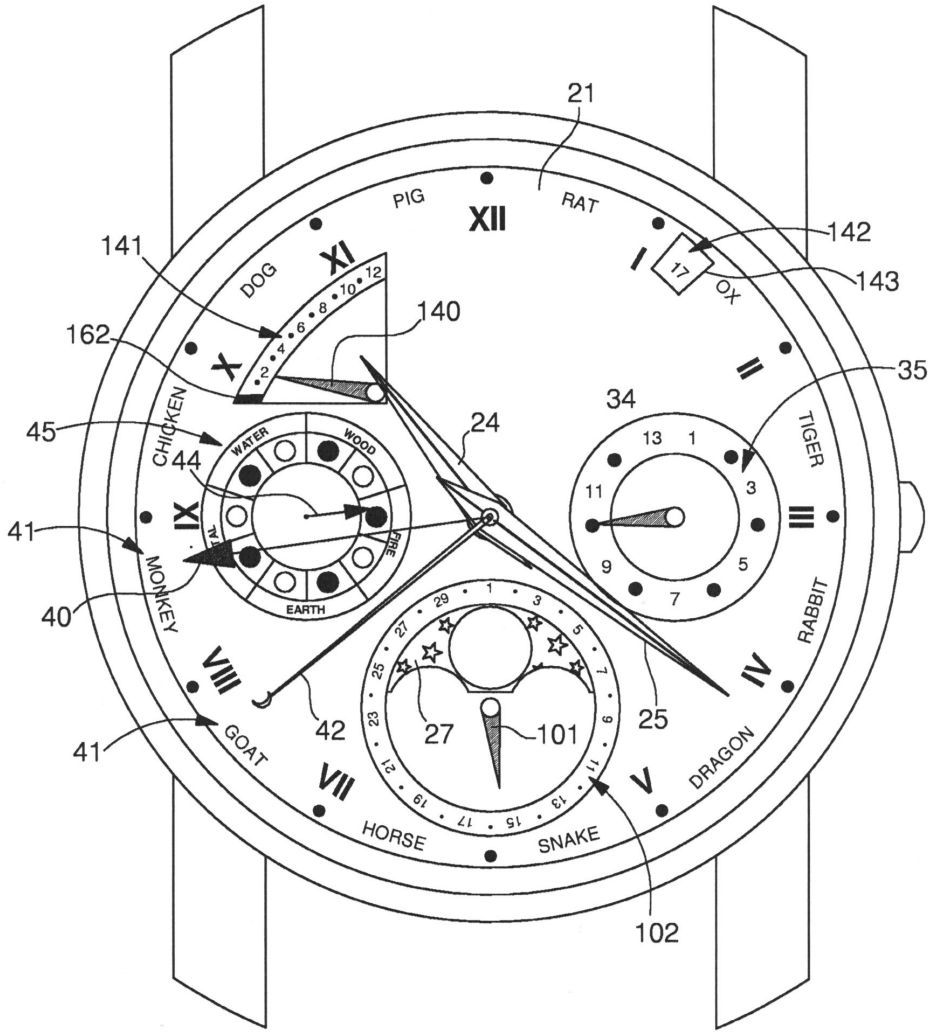
Chinese calendar watches (1)

International patent of July 6, 2006. (Swatch Group)

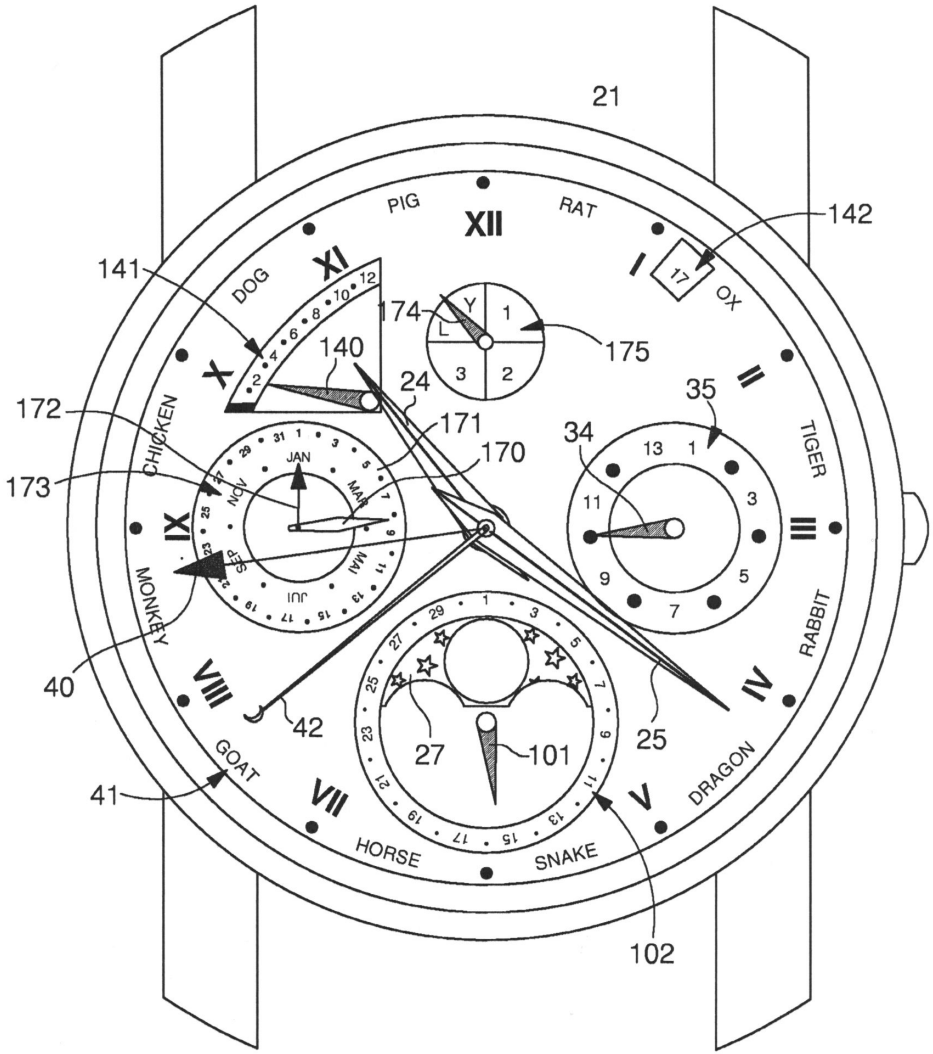
Chinese calendar watches (2)



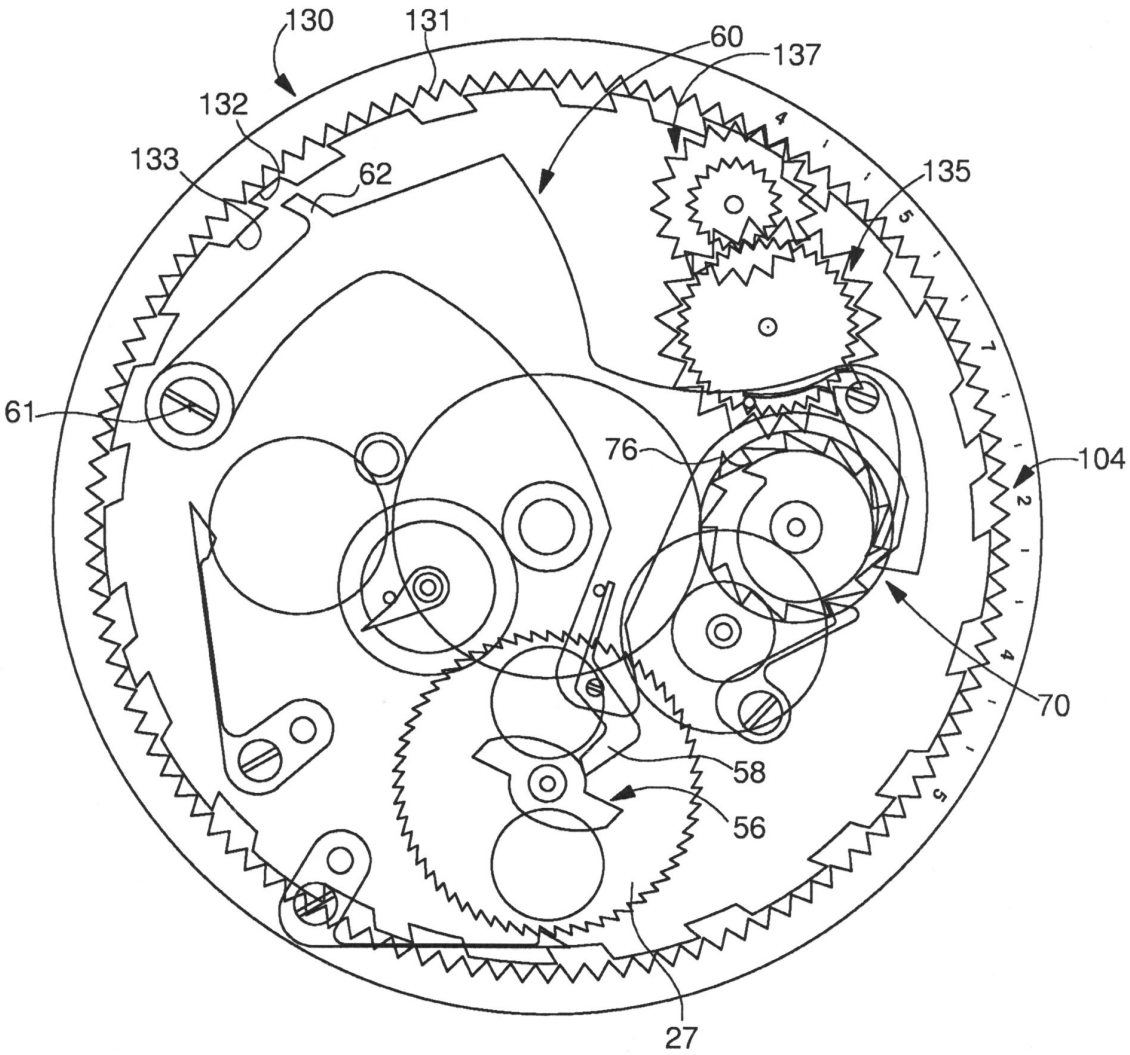
Chinese calendar watches (3)



Chinese calendar watches (4)

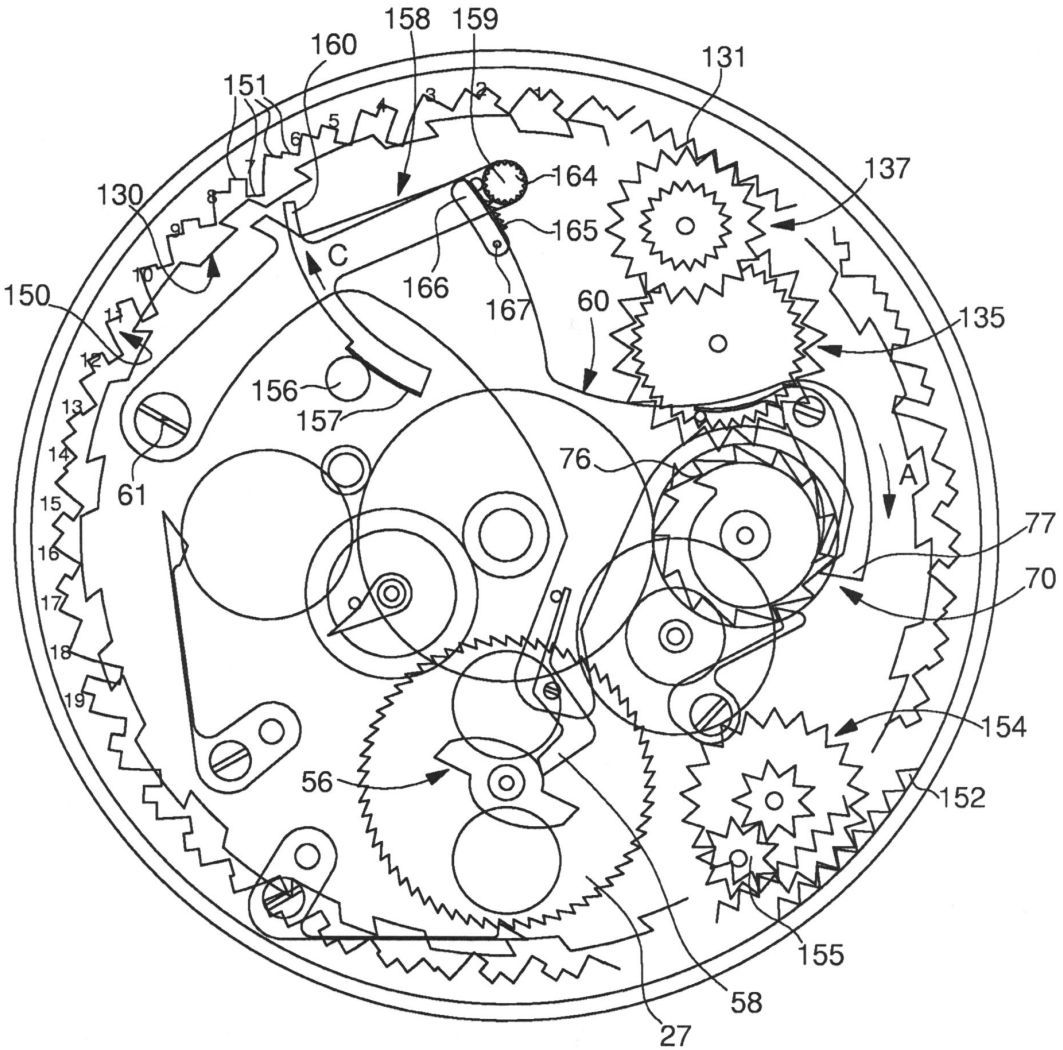


Chinese calendar watches (5)



Cam (132, 133) showing the embolismic years over about 60 years.

Chinese calendar watches (6)



- previous cam (130), and
- month lengths cam (150)

Chinese New Year

Chinese New Year: the 年獸 (nián shòu)

Legend of the Nián

- 獸 (shòu) = beast
- imaginary monster which brings bad luck;
- when the Nián comes, trees die, leaves lay on the ground and the grass does no longer grow;
- as soon as it has left, everything alive develops and flowers open;
- in order to hunt it away, fireworks are used.

Chinese New Year

- 春節 (chūn jié)
- 農歷新年 (nóng lì xīn nián) (agriculture, calendar, new,year)
- the year (beginning of month 1 nián) can start between January 21 and February 21;
- approximate rules:
  1. the New Year falls on the day of the second New Moon (新月, [しんげつ]) after the December solstice (冬至); this is only true until 2033;
  2. the New Year falls on the day of the New Moon closest to 立春 (Lì chūn) (approximately on February 4); this rule fails 31 times between 1645 and 2644.

Origin of Chinese years

4706	rat	February 7, 2008
4707	ox	January 26, 2009
4708	tiger	February 10, 2010

- traditionaly, the years were numbered by reigns;
- before the 1911 revolution (fall of the Qīng (清) dynasty), Sun Yat-sen (孫中山) [孫文 (そんぶん)] wanted to impose an alternative numbering;
- Chinese tradition: first year of the reign of the Yellow Emperor (黃帝, Huángdì) in 2697 B.C., hence 2008 = beginning of $2697 + 2008 = 4705$; by adding 1 (for a year 0), we find 4706, but there was no year 0...;
- another possibility is to start with what some believe is the earliest use of the sexagenary cycle on March 8, 2637 B.C., hence 2008 = beginning of $2637 + 2008 = 4645$.

The main Chinese festivals

Date	Festival	Chinese name	2008
month 1 day 1	Spring Festival (Chinese New Year)	春節 (chūn jié)	February 7
month 1 day 15	Lantern Festival	元宵節 (yuán xiāo jié)	February 21
month 5 day 5	Dragon Boat Festival	端午節 (duān wǔ jié)	June 8
month 7 day 7	Qi Qiao Jie (Chinese Valentine)	乞巧節 (qí qiǎo jié)	August 7
month 7 day 15	Ghost Festival	中元節 (zhōng yuán jié)	August 15
month 8 day 15	Mid-Autumn Festival (Moon Festival)	中秋節 (zhōng qiū jié)	September 14
month 9 day 9	Double Ninth Festival	重陽節 (zhòng yáng jié)	October 7

+ Qing Ming and the Winter solstice Festival (solar calendar)

Chinese calendar: the time of the day

- the days are also subdivided, in hours, etc.
- six hours of day, six of night;
- Japanese clocks;
- all that, in another talk...

Japanese calendar (和暦, われき)

A woman consults a calendar of the 15th year of 天保 (てんぽう) (1830–1844).

Japanese calendar (和暦, われき)

There are different words to refer to calendars, but they are all based on

暦

[れき, reki] or [こよみ, koyomi]

- 中国暦 (ちゅうごくれき, chūgoku reki): Chinese calendar;
- 和暦 (われき, wa reki): traditional (Japanese) calendar.

Japanese calendar (和暦, われき)

History

Japan adapted a number of Chinese calendars:

- before 604 C.E., the traditional Hi-oki calendar was purely lunar;
- in 604, the Yuan Chia Li (*Genka-reki*) calendar, designed by Ho Chhêng-Thien (443 C.E.), was introduced by the Korean monk Kanroku (觀勒) and adopted;
- work of Bu Kong (不空, Bù Kōng, 705–774): introduction of the planetary names in the calendars;
- several calendars followed until 861 C.E.;
- in 861, the 宣明暦 (Hsüan Ming Li) (*Senmyō-reki*) calendar was inaugurated, and it was in use until 1684;

Japanese calendar: Bu Kong (不空) (705–774)

The Japanese calendars: (source: 中国暦 on ja.wikipedia)

- Hi-Oki reki (ひおき)
- 元嘉暦: Genka reki (げんかれき) (year of 365.2467 days and lunar month of 29.530585 days) (in China from 445 C.E. to 509, in Japan from 604 until 696);
- 儀鳳暦: Giho reki (ぎほれき) (used in China from 665 to 728 and in Japan from 697 to 763);
- 大衍暦: Taien reki (たいえんれき) (used in China from 729 to 761 and in Japan from 764 to 862);
- 宣明暦: Senmyō reki (せんみょうれき) (used in China from 822 to 892 and in Japan from 862 to 1684);
- 貞享暦: Jōkyō reki (じょうきょうれき) (used in Japan from 1685 to 1754);
- 宝暦暦: Hōryaku reki (ほうりゃくれき) (used in Japan from 1755 to 1797);
- 寛政暦: Kansei reki (かんせいれき) (used in Japan from 1798 to 1844);
- 天保暦: Tenpō reki (てんぽうれき) (used in Japan from 1844 to 1872).

The Kansei reki (寛政暦) (1798)

- 麻田剛立 (Asada Gōryū, [あさだごうりゅう]) (1734–1799) (the Japanese Galileo) had to reform the calendar, but he recommended two of his pupils for that task:
  - 高橋至時 (Takahashi Yoshitoki) (1764–1804) and
  - 間重富 (Hazama Shigetomi) (1756–1816)

  They were the ones who designed the Kansei calendar (寛政暦);
- it is the first Japanese calendar to make use of the true Sun, and not of the mean Sun (corresponds to the 1645 reform in China);
- Yoshitoki introduced Kepler's model (ellipses) in the modelling of the orbits;
- Yoshitoki has been working at the translation of the Dutch version of Lalande's Astronomie, until his death in 1804.

The Tenpō reki (天保暦) and ... France

The 1841 reform, designed by 渋川景佑 (Shibukawa Kagesuke, 1787–1856, Yoshitoki's son), adopted in 1843 or 1844 (Tenpō calendar 天保暦), is based on the work of the French astronomer Lalande (1732–1807), author of a multi-volume *Traité d'astronomie*; Shibukawa Kagesuke is the co-translator of the Dutch version of Lalande's work.

Computing the Japanese calendar

- the computation is similar to the one made for the construction of the Chinese calendar:
  - determination of the せっき using a knowledge of the apparent motion of the Sun;
  - determination of the New Moons with a good theory of the Moon;
- the computation is not based on the 120° E meridian:
  - from 1873 to 1887 the computation was based on the Tokyo longitude (139°46′ E);
  - since 1888, the 135° E meridian (UT + 9h) is used;
  - in certain cases, on average once out of 24, there is a difference of one day between the beginnings of the months in China and Japan, and also in the dates of the せっき.

The 大小暦 (だいしょうれき): let's play with the calendar!

- during the 江戸 (Edo) period (= 徳川 Tokugawa period) (1603–1867), Japanese calendars showing only the lengths of the short (29) and long months (30) appeared;
- these calendars were called 大小暦 (だいしょうれき) and were very popular;
- 大 (だい): long;
- 小 (しょう): short;
- these calendars are much sought by collectors.

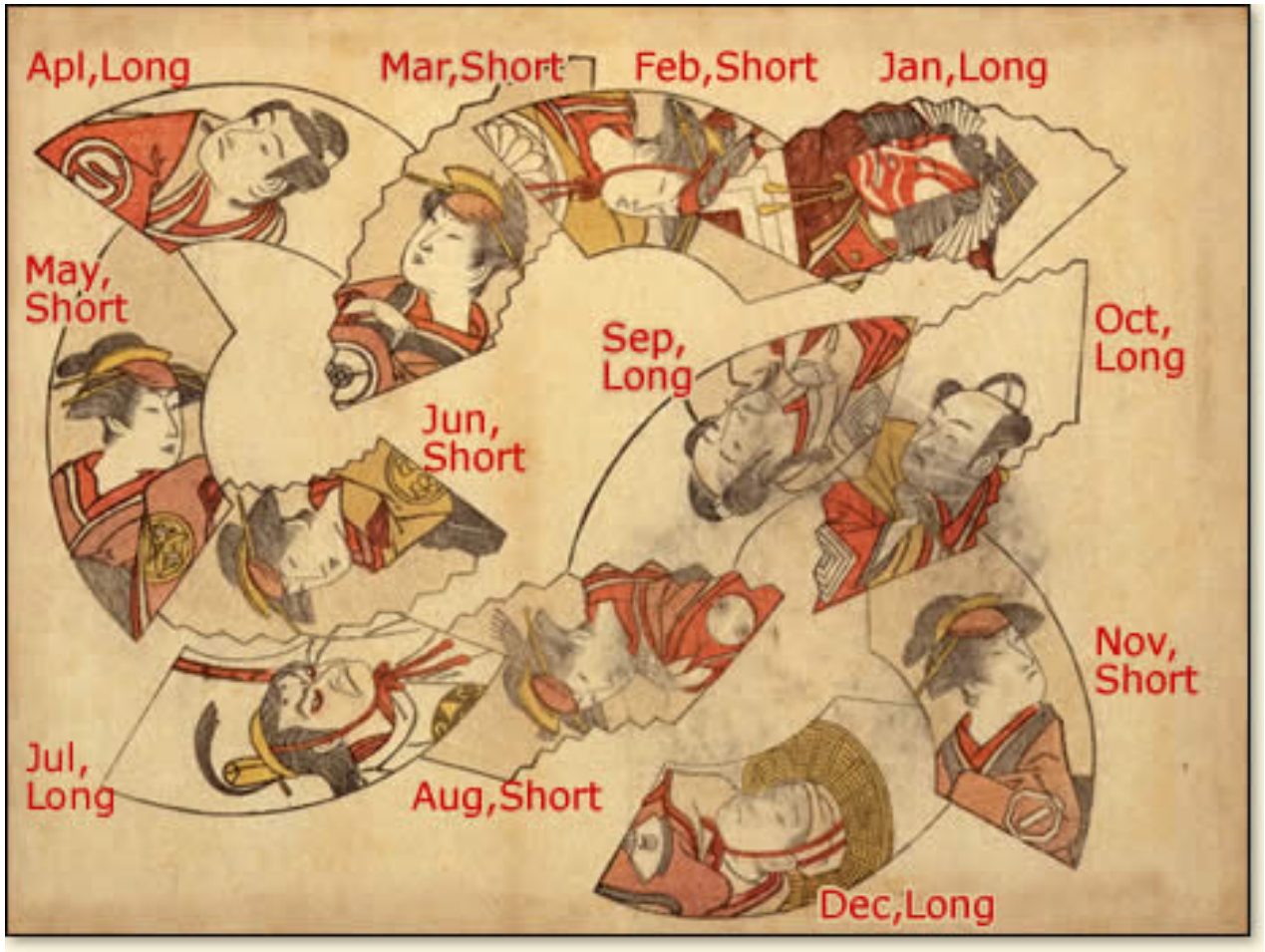
The 大小暦: example (1: riddle)

This 1787 calendar represents twelve fans with Kabuki actors.

Which months are long and which ones are short?

(this calendar differs from the ones that can be obtained with Chinese calendar conversion programs, perhaps because of the differences between Chinese and Japanese calendars)

The 大小暦: example (1: answer)

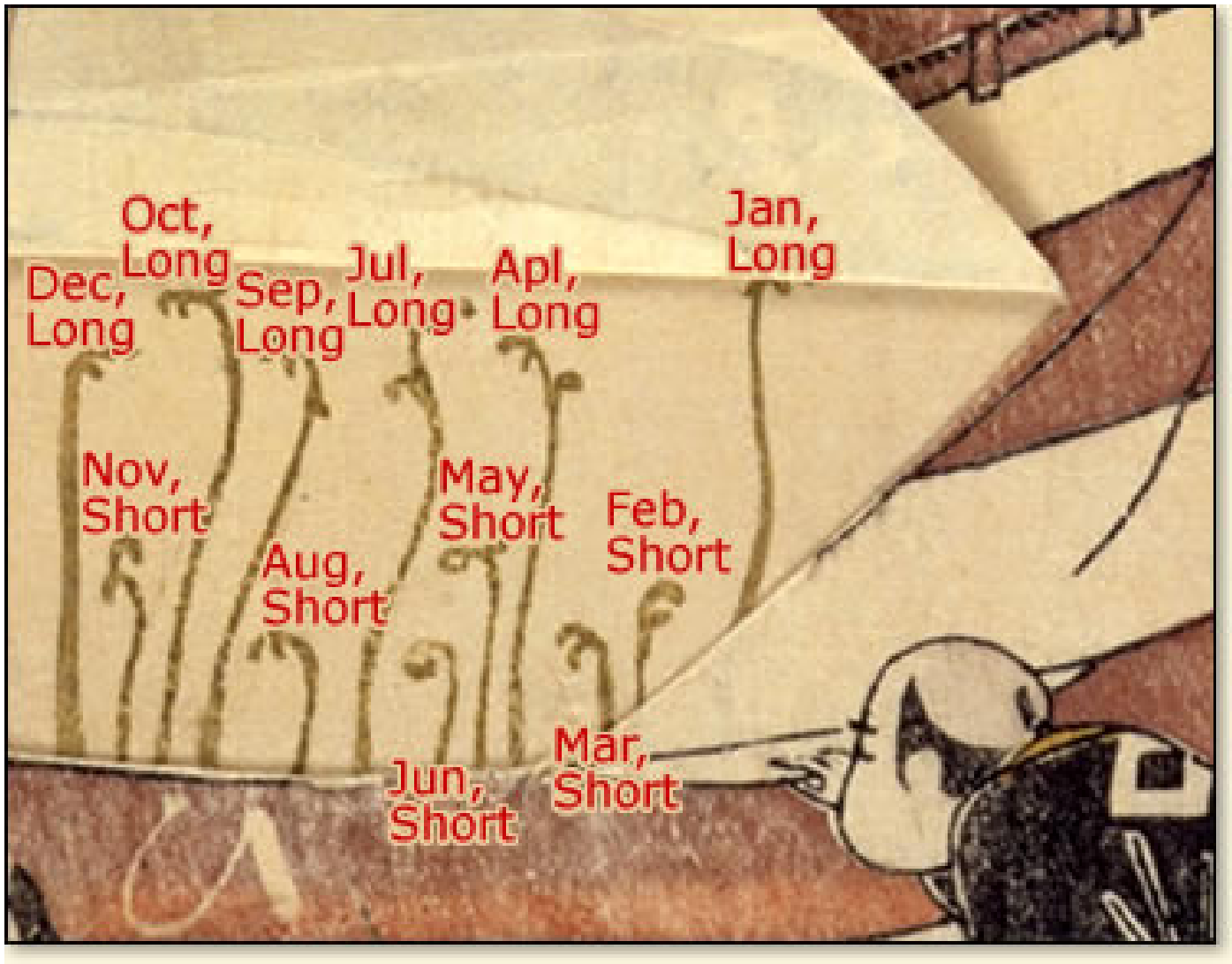


(note: the months should not be called Jan, Feb, etc., but 一月, 二月, etc., because they are the months of the 年 calendar)

The 大小暦: example (2: riddle)

This 1787 calendar represents the cherry blossom festival.

The 大小暦: example (2: answer)



The 大小暦: example (3: riddle)

This 1787 calendar represents the game of 双六 (すごろく).

The 大小暦: example (3: answer)

The 大小暦: example (4: riddle)

This 1854 calendar represents a samurai in armor.

The 大小暦: example (4: answer)

- the numbers at the top correspond to long months (Feb → 二月, etc.);
- the numbers at the bottom correspond to short months (Jan → 一月, etc.);
- month 7 (七月, marked "Jul" here) is followed by a leap month (閏月 or 閏).

Chinese calendar: 1854 example

1854

日	一	二	三	四	五	六
1 初三	2 初四	3 初五	4 初六	5 小寒	6 初八	7 初九
8 初十	9 十一	10 十二	11 十三	12 十四	13 十五	14 十六
15 十七	16 十八	17 十九	18 二十	19 廿一	20 大寒	21 廿三
22 廿四	23 廿五	24 廿六	25 廿七	26 廿八	27 廿九	28 三十
29 正月	30 初二	31 初三				

日	一	二	三	四	五	六
			1 初四	2 初五	3 初六	4 立春
5 初八	6 初九	7 初十	8 十一	9 十二	10 十三	11 十四
12 十五	13 十六	14 十七	15 十八	16 十九	17 二十	18 廿一
19 雨水	20 廿三	21 廿四	22 廿五	23 廿六	24 廿七	25 廿八
26 廿九	27 二月	28 初二				

日	一	二	三	四	五	六
			1 初三	2 初四	3 初五	4 初六
5 初七	6 惊蛰	7 初九	8 初十	9 十一	10 十二	11 十三
12 十四	13 十五	14 十六	15 十七	16 十八	17 十九	18 二十
19 廿一	20 廿二	21 春分	22 廿四	23 廿五	24 廿六	25 廿七
26 廿八	27 廿九	28 三十	29 三月	30 初二	31 初三	

日	一	二	三	四	五	六
						1 初四
2 初五	3 初六	4 初七	5 清明	6 初九	7 初十	8 十一
9 十二	10 十三	11 十四	12 十五	13 十六	14 十七	15 十八
16 十九	17 二十	18 廿一	19 廿二	20 谷雨	21 廿四	22 廿五
23 廿六	24 廿七	25 廿八	26 廿九	27 四月	28 初二	29 初三
30 初四						

日	一	二	三	四	五	六
	1 初五	2 初六	3 初七	4 初八	5 初九	6 立夏
7 十一	8 十二	9 十三	10 十四	11 十五	12 十六	13 十七
14 十八	15 十九	16 二十	17 廿一	18 廿二	19 廿三	20 廿四
21 小满	22 廿六	23 廿七	24 廿八	25 廿九	26 三十	27 五月
28 初二	29 初三	30 初四	31 初五			

日	一	二	三	四	五	六
				1 初六	2 初七	3 初八
4 初九	5 初十	6 芒种	7 十二	8 十三	9 十四	10 十五
11 十六	12 十七	13 十八	14 十九	15 二十	16 廿一	17 廿二
18 廿三	19 廿四	20 廿五	21 廿六	22 夏至	23 廿八	24 廿九
25 六月	26 初二	27 初三	28 初四	29 初五	30 初六	

日	一	二	三	四	五	六
						1 初七
2 初八	3 初九	4 初十	5 十一	6 十二	7 小暑	8 十四
9 十五	10 十六	11 十七	12 十八	13 十九	14 二十	15 廿一
16 廿二	17 廿三	18 廿四	19 廿五	20 廿六	21 廿七	22 廿八
23 大暑	24 三十	25 七月	26 初二	27 初三	28 初四	29 初五
30 初六	31 初七					

日	一	二	三	四	五	六
		1 初八	2 初九	3 初十	4 十一	5 十二
6 十三	7 十四	8 立秋	9 十六	10 十七	11 十八	12 十九
13 二十	14 廿一	15 廿二	16 廿三	17 廿四	18 廿五	19 廿六
20 廿七	21 廿八	22 廿九	23 处暑	24 闰七月	25 初二	26 初三
27 初四	28 初五	29 初六	30 初七	31 初八		

日	一	二	三	四	五	六
					1 初九	2 初十
3 十一	4 十二	5 十三	6 十四	7 十五	8 白露	9 十七
10 十八	11 十九	12 二十	13 廿一	14 廿二	15 廿三	16 廿四
17 廿五	18 廿六	19 廿七	20 廿八	21 廿九	22 八月	23 秋分
24 初三	25 初四	26 初五	27 初六	28 初七	29 初八	30 初九

日	一	二	三	四	五	六
1 初十	2 十一	3 十二	4 十三	5 十四	6 十五	7 十六
8 寒露	9 十八	10 十九	11 二十	12 廿一	13 廿二	14 廿三
15 廿四	16 廿五	17 廿六	18 廿七	19 廿八	20 廿九	21 三十
22 九月	23 初二	24 霜降	25 初四	26 初五	27 初六	28 初七
29 初八	30 初九	31 初十				

日	一	二	三	四	五	六
			1 十一	2 十二	3 十三	4 十四
5 十五	6 十六	7 十七	8 立冬	9 十九	10 二十	11 廿一
12 廿二	13 廿三	14 廿四	15 廿五	16 廿六	17 廿七	18 廿八
19 廿九	20 十月	21 初二	22 小雪	23 初四	24 初五	25 初六
26 初七	27 初八	28 初九	29 初十	30 十一		

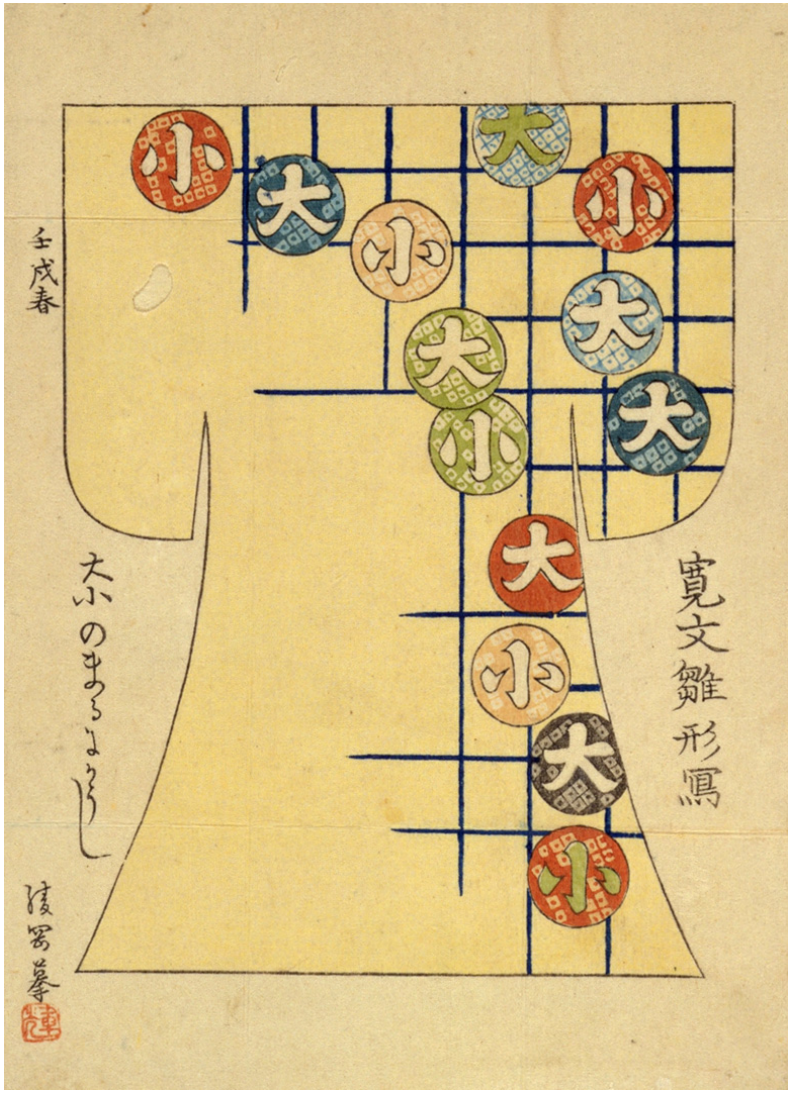
日	一	二	三	四	五	六
					1 十二	2 十三
3 十四	4 十五	5 十六	6 十七	7 大雪	8 十九	9 二十
10 廿一	11 廿二	12 廿三	13 廿四	14 廿五	15 廿六	16 廿七
17 廿八	18 廿九	19 三十	20 十一月	21 初二	22 冬至	23 初四
24 初五	25 初六	26 初七	27 初八	28 初九	29 初十	30 十一
31 十二						

Chinese calendar: 1854 example (detail)

日	一	二	三	四	五	六
						1 初七
2 初八	3 初九	4 初十	5 十一	6 十二	7 小暑	8 十四
9 十五	10 十六	11 十七	12 十八	13 十九	14 二十	15 廿一
16 廿二	17 廿三	18 廿四	19 廿五	20 廿六	21 廿七	22 廿八
23 大暑	24 三十	25 七月	26 初二	27 初三	28 初四	29 初五
30 初六	31 初七					

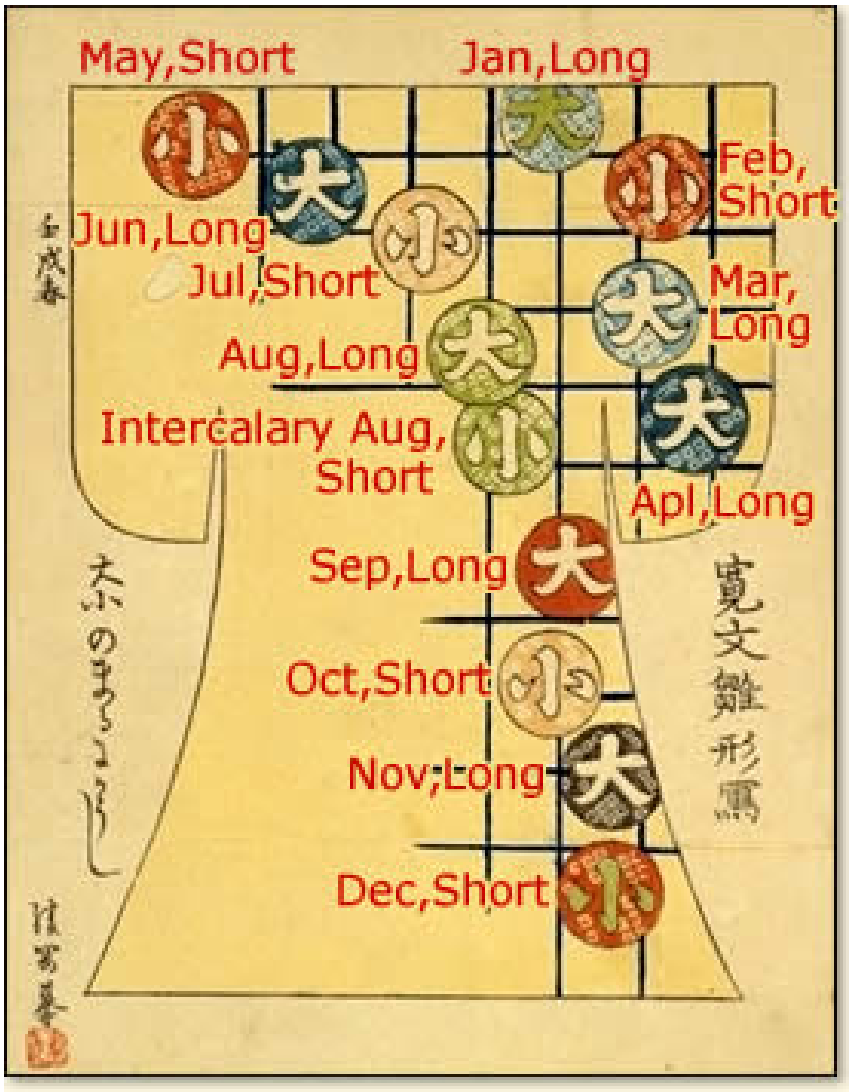
日	一	二	三	四	五	六
		1 初八	2 初九	3 初十	4 十一	5 十二
6 十三	7 十四	8 立秋	9 十六	10 十七	11 十八	12 十九
13 二十	14 廿一	15 廿二	16 廿三	17 廿四	18 廿五	19 廿六
20 廿七	21 廿八	22 廿九	23 处暑	24 闰七月	25 初二	26 初三
27 初四	28 初五	29 初六	30 初七	31 初八		

The 大小暦: example (5: riddle)



This 1862 calendar shows kimono patterns.

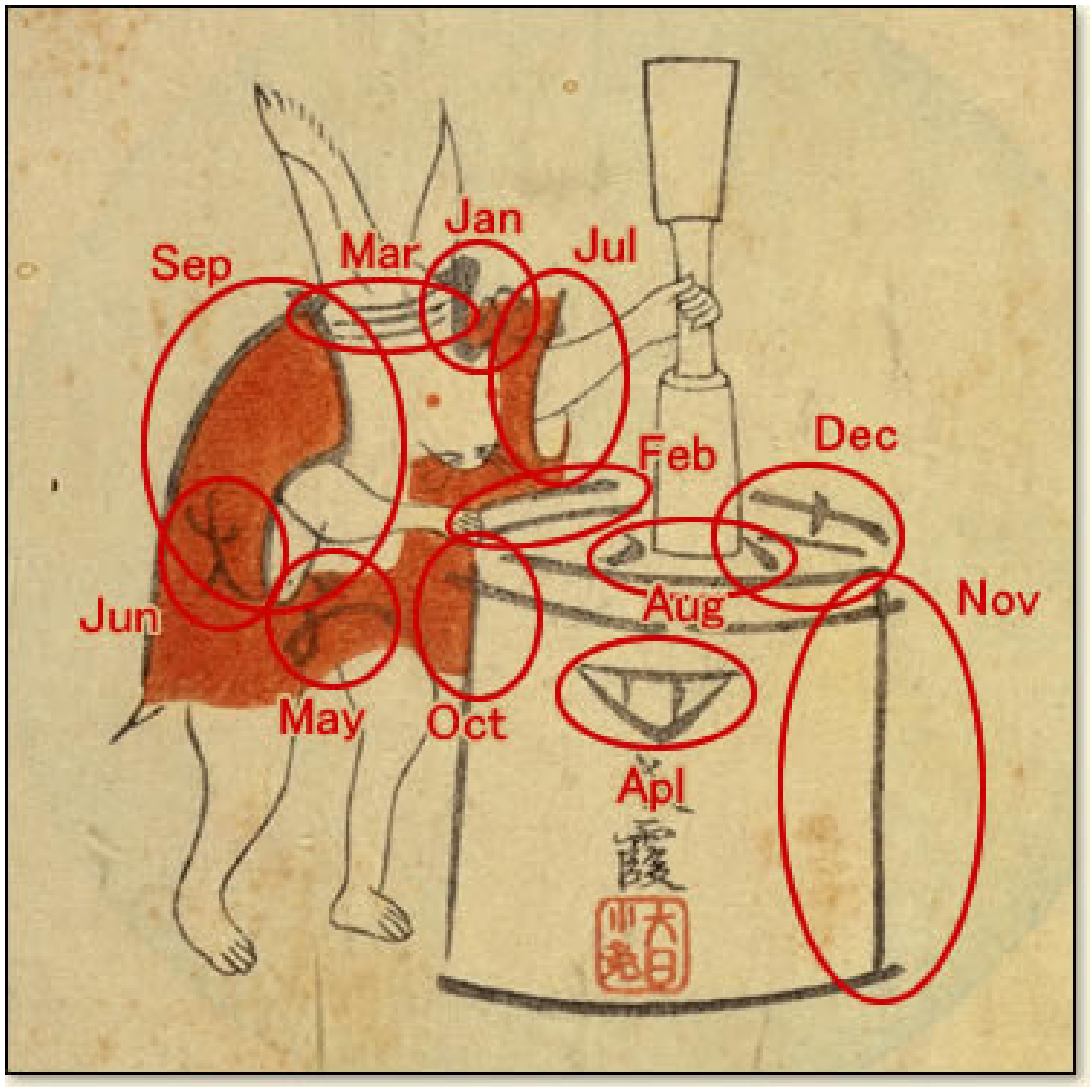
The 大小暦: example (5: answer)



The 大小暦: example (6: riddle)

- this 1867 calendar shows a rabbit busy preparing 餅 (in Chinese : 麻糬) (mochi);
- 1867: start of the year of the rabbit...

The 大小暦: example (6: answer)

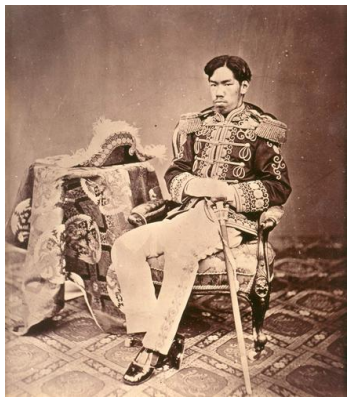


- short months are on the rabbit;
- long months are on the mortar.

The Japanese calendars after 1872

- Japan adopted the Gregorian calendar in 1873;
- the old calendar is also called
  Kyūreki (旧歴, きゅうれき) (kyū = old).

Japanese calendar: Emperor eras



Meiji 明治 (1867–1912)
Meiji Emperor (1852–1912)

Taishō 大正 (1912–1926)
Taishō Emperor (1879–1926)

Shōwa 昭和 (1926–1989)
Shōwa Emperor (1901–1989)

Heisei 平成 (since 1989)
Akihito Emperor (明仁) (1933–)
future Heisei Emperor

Japanese calendar: identification of the years

There are four methods for the specification of the year:

1. (since 645 C.E.), the year can be given by the 年号 (ねんごう, nengō) Era, then by the year in the Era, 2008 = Heisei 20;
2. the year can be given in the sexagenary cycle (for instance the year 戊子);
3. the year can be given in the reign of the Emperor (first year of reign = first complete year, not the accession year);
4. the year can be given since 660 B.C., the legendary year of the foundation of the Imperial dynasty; it is specified with 紀元 (きげん, kigen) or 公庫 (こうき, kōki).

It is only since 1868 (Meiji Era 明治) that Era = Reign.

Japanese calendar: weeks and months

- months can be noted either by their rank (正月 ou 一月 for the first month, 二月 for the second, etc.), or by older names (in the 歳 or 年?):
  1. 睦月 (mutsuki, むつき, month of harmony),
  2. 如月 (kisaragi, きさらぎ, month of wearing extra layers of clothes),
  3. 弥生 (yayoi, やよい, month of growth),
  4. 卯月 (uzuki, うずき, month of Deutzia),
  5. 早月 (satsuki, さつき, month of planting rice sprouts),
  6. 水無月 (minazuki, みなずき, month of no water),
  7. 文月 (fumizuki, ふみずき, month of literary),
  8. 葉月 (hazuki, はずき, month of leaves),
  9. 長月 (nagatsuki, ながつき, Autumn long month),
  10. 神無月 (kannazuki, かんなずき ou kaminazuki かみなずき, month of no Gods, opposite of kamiarizuki = かみありずき),
  11. 霜月 (shimotsuki, しもつき, month of frost),
  12. 師走 (shiwasu, しわす, month of running priests).
- these names are possibly synonyms of the months of the solar calendar.

Japanese calendar: remaining problems

The following month names need to be clarified. Are they other names of the solar calendar months?

- 初春 [しょしゅん;はつはる] first month of ???
- 晩春 [ばんしゅん] third month of ???
- 初夏 [しょか] fourth month of ???
- 晩夏 [ばんか] sixth month of ???
- 初秋 [しょしゅう] seventh month of ???
- 晩秋 [ばんしゅう] ninth month of ???
- 初冬 [しょとう] tenth month of ???
- 晩冬 [ばんとう] twelfth month of ???

And what about the following ones?

- 暮春 [ぼしゅん] third month of ???
- 暮秋 [ぼしゅう] ninth month of ???
- 上冬 [じょうとう] tenth month of ???
- 亥月 [がいげつ] tenth month of ???
- 子月 [ねづき] eleventh month of ???

Japanese calendar: main festivals

- the Japanese do generally not celebrate the Chinese New Year;
- matsuri (祭, まつり) = festival;
- the festivals vary according to the places in Japan;
- most festivals are at fixed dates, and are not related to the Chinese calendar;
- almost everywhere, there is a festival related to the rice crop around the beginning of Autumn.

Japanese festivals

Main Japanese festivals

- Shōgatsu (正月): New Year (January 1–3);
- Seijin Shiki (成人式): Coming of Age day (second Monday of January);
- Setsubun (節分): start of Japanese seasons, especially the Spring;
- Hina matsuri (雛祭り): Doll Festival (March 3);
- Hanami (花見): Flower viewing (end of March/beginning of April);
- Kodomo no hi (子供の日): Boy's day (May 5); = beginning of horse month Festival (端午の節句, Tango no Sekku);
- Tanabata (七夕): Star Festival (July 7);
- O-Bon (お盆): Ancestors' Spirits Festival (August 13–15);
- Tōrō Nagashi (灯篭流し): Lantern Floating = end of O-Bon;
- Shichi-Go-San (七五三): Festival of children age 3, 5 and 7 (November 15);
- Toshi no se (年の瀬): End of year, preparation of New Year;
- Ōmisoka (大晦日): New Year's Eve (December 31).

Japanese calendar: 六曜 (ろくよう, rokuyō)

Cycle of lucky and unlucky days (1)

The 六曜 is a system specifying the lucky and unlucky days in lunar months.

There are six different days:

1. 先勝 (せんしょう, せんかち, さきがち): good for business, good luck in the morning, bad luck in the afternoon

This system has a Chinese origin, and spread again after WWII.

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4. 仏滅 (ぶつめつ): bad luck all day
5. 大安 (たいあん, だいあん): good luck all day

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Cycle of lucky and unlucky days (1)

The 六曜 is a system specifying the lucky and unlucky days in lunar months.

There are six different days:

1. 先勝 (せんしょう, せんかち, さきがち): good for business, good luck in the morning, bad luck in the afternoon
2. 友引 (ともびき, ゆういん): good luck at all times, except at noon, and except for burials
3. 先負 (せんぷ, せんぶ, せんまけ, さきまけ): opposite of 先勝
4. 仏滅 (ぶつめつ): bad luck all day
5. 大安 (たいあん, だいあん): good luck all day
6. 赤口 (しゃっく, じゃっく, しゃっこう, じゃっこう, せきぐち): bad luck, except at noon

This system has a Chinese origin, and spread again after WWII.

Japanese calendar: 六曜 (ろくよう)

Cycle of lucky and unlucky days (2)

- the days repeat according to the series 先勝, 友引, 先負, 仏滅, 大安 and 赤口;
- the cycle is periodically interrupted because the first days of the lunar months always have the same 六曜:
  - months 1 and 7 start with 先勝,
  - months 2 and 8 start with 友引,
  - months 3 and 9 start with 先負,
  - months 4 and 10 start with 仏滅,
  - months 5 and 11 start with 大安 et
  - months 6 and 12 start with 赤口.

Today, we are the 4th day of month 3 (starting with 先負), hence it is a 赤口 day = bad luck!!!

Japanese calendar: what I didn't mention...

- 西暦 [せいれき] = C.E.
- 略歴 [りゃくれき]
- 年鑑 [ねんかん]
- きちじつ (kichijitsu): lucky day (link with the 六曜?)
- かんにち (kannichi): unlucky day (link with the 六曜?)

Before I finish ... a few words on Korea

- From 1653 until 1896, Korea used the Chinese calendar, but made its own computations;
- in 1896 Korea adopted the Gregorian calendar;
- one form of Chinese calendar is still used traditionally;
- the reference meridian currently used is the meridian of the Seoul City Hall (126°58′ E);
- the years are counted from 2333 B.C., the traditional year of the foundation of the first Korean nation.

The traditional calendar in Korea

In Korea, the 24 "jié qì" are called the 24 (이십사) "Jeol-gi" (절기).

J_1	Ipchun	입춘	J_7	Ipchoo	입추
Z_1	Woosoo	우수	Z_7	Cheoseo	처서
J_2	Gyungchip	경칩	J_8	Baekro	백로
Z_2	Chunboon	춘분	Z_8	Chooboon	추분
J_3	Chungmyung	청명	J_9	Hanro	한로
Z_3	Gokwoo	곡우	Z_9	Sangang	상강
J_4	Ipha	입하	J_{10}	Ipdong	입동
Z_4	Soman	소만	Z_{10}	Soseol	소설
J_5	Mangjong	망종	J_{11}	Daeseol	대설
Z_5	Haji	하지	Z_{11}	Dongji	동지
J_6	Soseo	소서	J_{12}	Sohan	소한
Z_6	Daeseo	대서	Z_{12}	Daehan	대한

The lunar New Year is called "Seollal" (설날).
There is also an equivalent to the Earthly branches and Celestial stems.

Branches and stems in Korea

Earthly branches											
자	축	인	묘	진	사	오	미	신	유	술	해
ja	chug	in	myo	jin	sa	o	mi	sin	yu	su	hae

Celestial stems									
갑	을	병	정	무	기	경	신	임	계
gab	eul	byeong	jeong	mu	gi	gyeong	sin	im	gye

And in Viêt-nam...

- calendar similar to the Chinese calendar;
- earthly branches, celestial stems, and 24 “tiết khí”;
- before 1813, the calendar was not computed exactly like in China (apparently, the calendar in use was 大統曆法, hence the pre-1645 Chinese calendar);
- from 1813 to 1967, the Chinese calendar was used;
- since 1968 (North Viêt-nam) or 1976 (whole country), the reference meridian is the Hanoi meridian.

The traditional calendar in Viêt-nam: the 24 "tiết khí"

J_1	Lập xuân	J_7	Lập thu
Z_1	Vũ thủy	Z_7	Xử thử
J_2	Kinh trập	J_8	Bạch lộ
Z_2	Xuân phân	Z_8	Thu phân
J_3	Thanh minh	J_9	Hàn lộ
Z_3	Cốc vũ	Z_9	Sương giáng
J_4	Lập hạ	J_{10}	Lập đông
Z_4	Tỉêu mãn	Z_{10}	Tỉêu tuyết
J_5	Mang chủng	J_{11}	Đại tuyết
Z_5	Hạ chí	Z_{11}	Đông chí
J_6	Tỉêu thử	J_{12}	Tỉêu hàn
Z_6	Đại thử	Z_{12}	Đại hàn

Branches and stems in Viêt-nam

Earthly branches (Thập Nhị Chi)											
Tý	Sửu	Dần	Mão	Thìn	Tỵ	Ngọ	Tuất	Mùi	Thân	Dậu	Hợi

Celestial stems (Thiên Can)									
Giáp	Ất	Bính	Đinh	Mậu	Kỷ	Canh	Tân	Nhâm	Quý

The twelve animals are the rat, the buffalo, the tiger, the cat, the dragon, the snake, the horse, the goat, the monkey, the rooster, the dog and the pig.

In Tibet...

- lunisolar calendar, but not directly inspired by the Chinese calendar;
- Indian origin;
- the symbols are different, Tibet is not using the Chinese characters, but has its own alphabet;
- the details for another time...

Calendar conversions

- when the calendars are well defined, the conversion from one calendar to the other is straightforward:
  - tables can be used (for instance *Calendrical Tabulations* by Reingold and Dershowitz (2002));
  - there are also many programs;
  - errors can occur, either in tables or in software;
- for certain periods of time, especially distant in the past, it is not always known how the computations were done, and this can make it difficult to convert between calendars.

Sources and bibliographic orientations (1)

The essential sources on the Chinese calendar (among those we consulted) are marked ⋆⋆⋆. Then come the ⋆⋆ sources, then ⋆, then the anecdotic sources. Those who would like to study these calendars in more depth should first consult the ⋆⋆⋆ sources, before continuing with the others.

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