Julian day

<https://en.wikipedia.org/wiki/Julian_day>

## **Julian day number calculation[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=6)**]**

The Julian day number can be calculated using the following formulas ([integer division](https://en.wikipedia.org/wiki/Integer_division) rounding towards zero is used exclusively, that is, positive values are rounded down and negative values are rounded up):

*The months January to December are numbered 1 to 12. For the year,*[*astronomical year numbering*](https://en.wikipedia.org/wiki/Astronomical_year_numbering)*is used, thus 1 BC is 0, 2 BC is −1, and 4713 BC is −4712.*JDN*is the Julian Day Number. Use the previous day of the month if trying to find the JDN of an instant before midday UT.*

### Converting Gregorian calendar date to Julian Day Number**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=7)**]**

The algorithm is valid for all (possibly [proleptic](https://en.wikipedia.org/wiki/Proleptic_Gregorian_calendar)) Gregorian calendar dates after November 23, −4713. Divisions are integer divisions, fractional parts are ignored.[[72]](https://en.wikipedia.org/wiki/Julian_day#cite_note-72)

JDN = (1461 × (Y + 4800 + (M − 14)/12))/4 +(367 × (M − 2 − 12 × ((M − 14)/12)))/12 − (3 × ((Y + 4900 + (M - 14)/12)/100))/4 + D − 32075

### Converting Julian calendar date to Julian Day Number**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=8)**]**

The algorithm[[73]](https://en.wikipedia.org/wiki/Julian_day#cite_note-73) is valid for all (possibly [proleptic](https://en.wikipedia.org/wiki/Proleptic_Julian_calendar)) Julian calendar years ≥ −4712, that is, for all JDN ≥ 0. Divisions are integer divisions, fractional parts are ignored.

JDN = 367 × Y − (7 × (Y + 5001 + (M − 9)/7))/4 + (275 × M)/9 + D + 1729777

### Finding Julian date given Julian day number and time of day**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=9)**]**

For the full Julian Date of a moment after 12:00 UT one can use the following. Divisions are real numbers.

{\displaystyle {\begin{matrix}J\!D&=&J\!D\!N+{\frac {{\text{hour}}-12}{24}}+{\frac {\text{minute}}{1440}}+{\frac {\text{second}}{86400}}\end{matrix}}}

So, for example, January 1, 2000, at 18:00:00 UT corresponds to *JD* = 2451545.25

For a point in time in a given Julian day after midnight UT and before 12:00 UT, add 1 or use the JDN of the next afternoon.

### Finding day of week given Julian day number**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=10)**]**

The US day of the [week](https://en.wikipedia.org/wiki/Week) **W1** (for an afternoon or evening UT) can be determined from the Julian Day Number **J** with the expression:

**W1** = [mod](https://en.wikipedia.org/wiki/Modular_arithmetic)(*J* + 1, 7)[[74]](https://en.wikipedia.org/wiki/Julian_day#cite_note-74)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **W1** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **Day of the week** | Sun | Mon | Tue | Wed | Thu | Fri | Sat |

If the moment in time is after midnight UT (and before 12:00 UT), then one is already in the next day of the week.

The ISO day of the week **W0** can be determined from the Julian Day Number **J** with the expression:

**W0** = mod (*J*, 7) + 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **W0** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Day of the week** | Mon | Tue | Wed | Thu | Fri | Sat | Sun |

### Julian or Gregorian calendar from Julian day number**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=11)**]**

This is an algorithm by Richards to convert a Julian Day Number, **J**, to a date in the Gregorian calendar (proleptic, when applicable). Richards states the algorithm is valid for Julian day numbers greater than or equal to 0.[[75]](https://en.wikipedia.org/wiki/Julian_day#cite_note-75)[[76]](https://en.wikipedia.org/wiki/Julian_day#cite_note-76) All variables are integer values, and the notation "*a* div *b*" indicates [integer division](https://en.wikipedia.org/wiki/Integer_division), and "mod(*a*,*b*)" denotes the [modulus operator](https://en.wikipedia.org/wiki/Modular_arithmetic).

|  |  |  |  |
| --- | --- | --- | --- |
| **Algorithm parameters for Gregorian calendar** | | | |
| **variable** | **value** | **variable** | **value** |
| *y* | 4716 | *v* | 3 |
| *j* | 1401 | *u* | 5 |
| *m* | 2 | *s* | 153 |
| *n* | 12 | *w* | 2 |
| *r* | 4 | *B* | 274277 |
| *p* | 1461 | *C* | −38 |

For Julian calendar:

1. *f* = **J** + *j*

For Gregorian calendar:

1. *f* = **J** + *j* + (((4 × **J** + *B*) div 146097) × 3) div 4 + *C*

For Julian or Gregorian, continue:

2. *e* = *r* × *f* + *v*

3. *g* = mod(*e*, *p*) div *r*

4. *h* = *u* × *g* + *w*

5. **D** = (mod(*h, s*)) div *u* + 1

6. **M** = mod(*h* div *s* + *m*, *n*) + 1

7. **Y** = (*e* div *p*) - *y* + (*n* + *m* - **M**) div *n*

**D**, **M**, and **Y** are the numbers of the day, month, and year respectively for the afternoon at the beginning of the given Julian day.

### Julian Period from indiction, Metonic and solar cycles**[**[**edit**](https://en.wikipedia.org/w/index.php?title=Julian_day&action=edit&section=12)**]**

Let Y be the year BC or AD and i, m and s respectively its positions in the indiction, Metonic and solar cycles. Divide 6916i + 4200m + 4845s by 7980 and call the remainder r.

If r>4713, Y = (r − 4713) and is a year AD.

If r<4714, Y = (4714 − r) and is a year BC.

Example

i = 8, m = 2, s = 8. What is the year?

(6916 × 8) = 55328; (4200 × 2) = 8400: (4845 × 8) = 38760. 55328 + 8400 + 38760 = 102488.

102488/7980 = 12 remainder 6728.

Y = (6728 − 4713) = AD 2015.[[77]](https://en.wikipedia.org/wiki/Julian_day#cite_note-77)

# Julian Day Problem Example

<https://www.youtube.com/watch?v=A9KJQje-340>

Julian day Wikipedia

<https://en.wikipedia.org/wiki/Julian_day>

DN = (1461 × (Y + 4800 + (M − 14)/12) )/4 +(367 × (M − 2 − 12 × ((M − 14)/12)))/12 − (3 × ((Y + 4900 + (M - 14)/12)/100))/4 + D − 32075

Youtube

Wikipedia

a = (1461 × (Y + 4800 + (M − 14)/12))/4

b = +(367 × (M − 2 − 12 × ((M − 14)/12)))/12

c = − (3 × ((Y + 4900 + (M - 14)/12)/100))/4

d =+ D – 32075