Computing the JD or UT

What is Julian Date? (about-jd)
JD Calculator and Calendars (jd-calculator)

Variable star observations reported to the AAVSO must be expressed either in terms of Universal Time (UT) or Julian Day (JD) and the decimal part of the day given in Greenwich Mean Astronomical Time (GMAT).

UNIVERSAL TIME (UT)
Often in astronomy you will see the time of events being expressed in Universal Time (or UT). This is the same as Greenwich Mean Time (GMT) which starts at midnight in Greenwich, England. To find the UT equivalent of a specific time, simply add to it, or subtract from it, as the case may be, the zone difference for your observing location.

JULIAN DATE (JD)
JD is the standard unit of time used by astronomers because it is convenient and unambiguous. Here are the advantages:

- The astronomical day runs from noon to noon so that you don't have to change calendar dates in the middle of the night.
- A single number represents days, months, years, hours, and minutes.
- Data on the same star from people observing anywhere in the world can be compared easily since they are all relative to the same time zone; that of the prime meridian in Greenwich, England.

DOING THE MATH
There is a JD calculator (jd-calculator) available to help you figure the JD so most people don't compute it themselves anymore, but it is still important to know how it is derived so you can check yourself and catch any typographical errors.

What follows is a simple procedure for figuring the JD and GMAT decimal of your observations. If you decide to submit your observations using UT, just follow steps 1 through 3.

Step-by-Step Instructions

1. Record the time and date of your observation using the 24-hour clock instead of AM or PM. (i.e. add 12 hrs if PM)
   examples:
   A. June 3, 2010 at 9:34 PM = June 3 at 21:34
   B. June 4, 2010 at 4:16 AM = June 4 at 04:16

2. If your observation was made when Daylight Savings Time (Summer Time) is in effect where you live, subtract one hour to get standard time.
   A. June 3 at 21:34 DST = June 3 at 20:34
   B. June 4 at 04:16 DST = June 4 at 03:16

3. Convert to UT by adding or subtracting your time zone difference from Greenwich, as the case may be. For this example we will assume that the observer is located 5 hours west of Greenwich. (Please note the date change in example "A".)
   A. June 3 at 20:34 + 5hr = June 4 at 01:34 UT

B. June 4 at 03:16 + 5hr = June 4 at 08:16 UT

4. To convert from UT to Greenwich Mean Astronomical Time (GMAT) subtract 12 hours. This is because GMAT runs from noon to noon rather than midnight to midnight. (Please note the date change in both examples.)
   A. June 4 at 01:34 UT = June 3 at 13:34 GMAT
   B. June 4 at 08:16 UT = June 3 at 20:16 GMAT

5. Find the decimal of the day equivalent of the hours and minutes of your observation by using this formula:

decimal part of the day = (minutes/60 + hours)/24

There is also a table (/sites/default/files/images/jdnumbertable.gif) you can use to look up these decimal equivalents.

A. 13:34 GMAT = .5653
B. 20:16 GMAT = .8444

6. Look up the Julian Date equivalent to the GMAT date of your observation as determined in Step 4 above. You can use the sample 2010 JD calendar (/sites/default/files/publications/jd_calendar/JD2010.pdf) for this.
   A and B: June 3, 2010 = 2,455,351

7. Now add the decimal to the JD integer determined in Step 3 to arrive at the final result of:
   A. JD = 2455351.5653
   B. JD = 2455351.8444

Below are three more examples showing how JDs are calculated using the steps just outlined. All of these examples use the 2010 JD Calendar (/sites/default/files/publications/jd_calendar/JD2010.pdf) and the JD decimal table.

Example 1 — Observation from Istanbul, Turkey (2 hrs east of Greenwich) at 1:15 am, January 10, 2010.

Step 1: 01:15 Jan 10 Local Time
Step 2: N/A
Step 3: 01:15 - 2 hrs = 23:15 Jan 9 UT
Step 4: 23:15 - 12 hrs = 11:15 Jan 9 GMAT
Step 5: decimal = .4688
Step 6: JD for Jan 9, 2010 = 2455206
Final Result: 2455206.4688

Example 2 — Observation from Vancouver, BC Canada (8 hrs west of Greenwich) at 5:21 am, February 14, 2010.

Step 1: 05:21 Feb 14 Local Time
Step 2: N/A
Step 3: 05:21 + 8 hrs = 13:21 Feb 14 UT
Step 4: 13:21 - 12 hrs = 01:21 Feb 14 GMAT
Step 5: JD = 2,455,242
Step 6: decimal = .0563
Final Result: 2,455,242.0563

Example 3 — Observation from Auckland, New Zealand (12 hrs east of Greenwich) at 8:25 pm, January 28, 2010.

Step 1: 20:25 Jan 28 Local Time
Step 2: 20:25 + 1 hr = 21:25 Jan 28 DST
Step 3: 21:25 -12 = 09:25 Jan 28 UT
Step 4: 09:25 - 12 = 21:25 Jan 27 GMAT
Step 5: JD = 2,455,224
Step 6: decimal = .8924
Final Result: 2,455,224.8924

Tags

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