A cleared lunar distance is used to determine what GMT that distance corresponds to. The *Nautical Almanac* listed the lunar distances for the moon and various objects at three-hour intervals. The cleared distance would lie within one of those intervals.

The basic idea is to use interpolation to find the time corresponding to the cleared distance.

If
D is the angular difference between the tabulated distances that bracket your cleared distance ($dd°mm'ss''_{UTCi}$ and $dd°mm'ss''_{UTCi+3}$), its' value to be used in calculations is given in the **P.L.** column of the *Precomputed Lunar Distances* table on the line of the first bracket ($dd°mm'ss''_{UTCi}$) in the form discussed below;

and
d is the angular difference between the earlier tabulated distance and your cleared distance: $dd°mm'ss''_{UTCi}$ and $dd°mm'ss''_{UTCi+t}$;

and
t is the yet unknown time interval hh:mm:ss between the earlier tabulated distance UTC and the moment of your lunar sight: UTC_i and UTC_{i+t};

then:

$$\frac{\mathbf{D}}{\mathbf{d}} = \frac{3\ [\text{hours}]}{\mathbf{t}}$$

or,

$$\mathbf{t}\ [\text{hours}] = 3\ [\text{hours}] \cdot \frac{\mathbf{d}}{\mathbf{D}}$$

or,

$$\mathbf{t}\ [\text{seconds}] = 10800\ [\text{seconds}] \cdot \frac{\mathbf{d}}{\mathbf{D}}$$

To simplify this calculation the "*proportional logarithm*" of time **t** as being *the common log of 10800 [seconds] minus the common log of* ***t*** *[seconds]* was introduced in the *Tables Requisite*.

Because

$$\mathbf{D} \cdot \mathbf{t} = 10800 \cdot \mathbf{d}$$

we can write:

$$\log \mathbf{D} + \log \mathbf{t} = \log 10800 + \log \mathbf{d}$$

or,

$$\log \mathbf{t} = \log 10800 + \log \mathbf{d} - \log \mathbf{D}$$

or, (subtracting each term from log of 10800 [seconds]):

$$(\log 10800 - \log \mathbf{t}) =$$
$$= (\log 10800 - \log 10800) + (\log 10800 - \log \mathbf{d}) - (\log 10800 - \log \mathbf{D})$$

or,

$$(\log 10800 - \log \mathbf{t}) = (\log 10800 - \log \mathbf{d}) - (\log 10800 - \log \mathbf{D})$$

Therefore:

$$\text{plog } \mathbf{t} = \text{plog } \mathbf{d} - \text{plog } \mathbf{D}$$

where *plog* is the *proportional logarithm* as defined above.

An example:

On 2015-Jan-01 the cleared distance between the Moon and Jupiter was found to be equal to 83°.

Looking up the *Precomputed Lunar Distances* table for that date one finds that the angle (83°) fits within the following brackets:

12:00 UT, 84° 35'.2, P.L. 2620
15:00 UT, 82° 56'.8, P.L. 2628

D, the total change in the distance during the three-hour interval (the angle between the brackets), equals to

84° 35.2' - 82° 56.8' = 1° 38.4'

The value to be used in the calculations (2620) is given in the **P.L.** column of the *Precomputed Lunar Distances* table for first (12:00 UT) bracket, so:

plog **D** = 2620

d is the angular difference between the distance tabulated for 12:00 UT and the distance cleared for the yet unknown time of lunar sight:

d = 84° 35.2' - 83° 00.0' = 1° 35.2'

Entering the ^{h}° ^{m}' column of the *Tables Requisite* with 1° 35.2' we find its' proportional logarithm value (2766) in the **P.L.** column, so:

plog **d** = 2766

The plog **t** is:

plog **t** = plog **d** - plog **D** = 2766 - 2620 = 146

Looking up *146* in *Tables Requisite* in the **P.L.** column we notice that it falls between the tabulated values of *145* and *147*, which correspond to 2^h 54.1^m and 2^h 54.0^m or 02:54:06 and 02:54:00 respectively.
The interpolated value of **t** is approximately equal to 02:54:03.

Adding the time offset **t** of the lunar to the UTC of the first tabulated bracket gives the UTC of the lunar sight itself:

12:00:00 + 02:54:03 = **14:54:03**