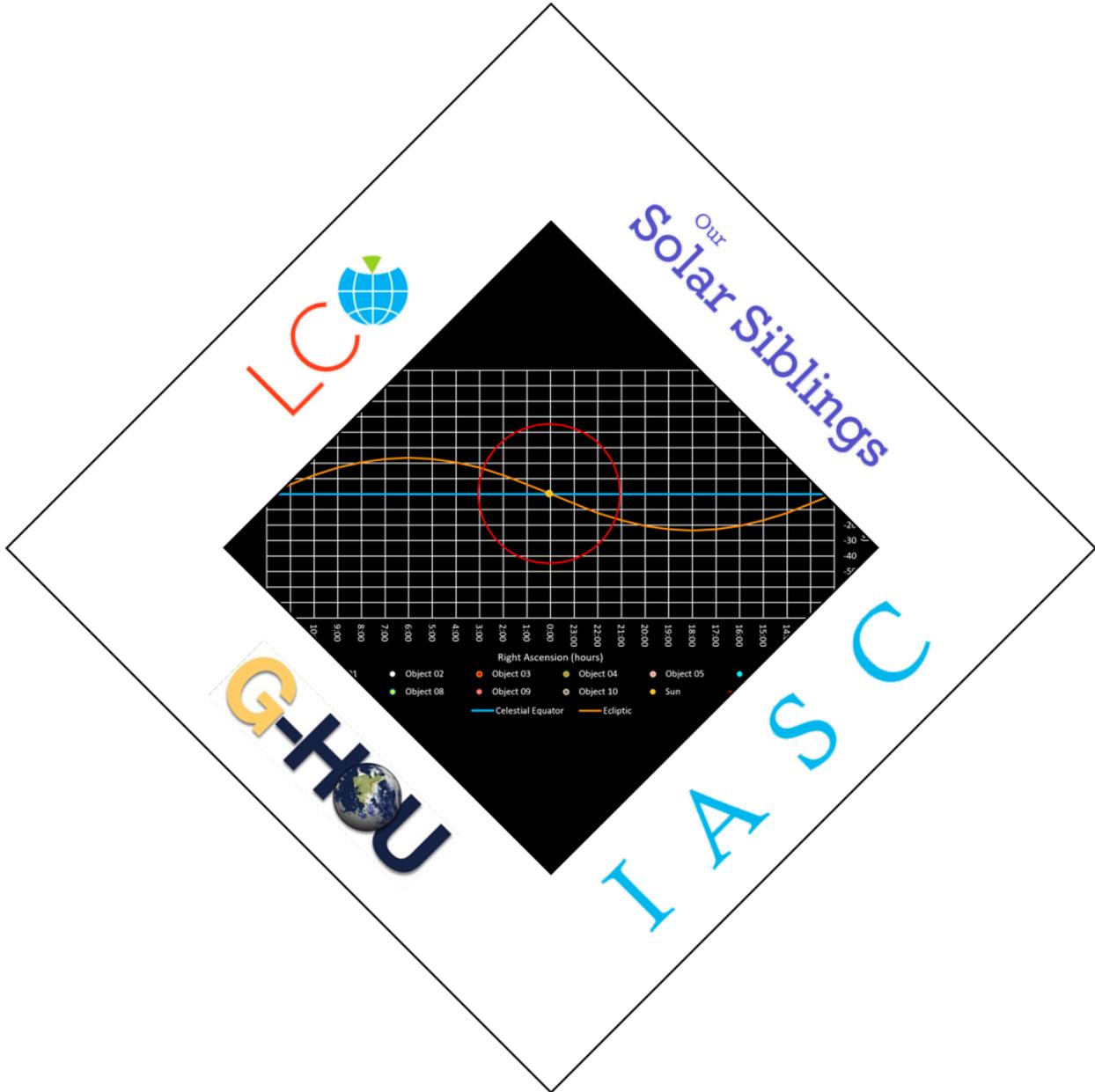


# LCO Observation Window



# LCO Manual

## (Images of Deep Sky Objects)

This manual shows you how to verify if an object you want to image is observable by the LCO Telescope Network. Specifically, for an object to be observable, it cannot be close to the sun and must be viewable during darkness.

Download STELLARIUM at: <https://stellarium.org>

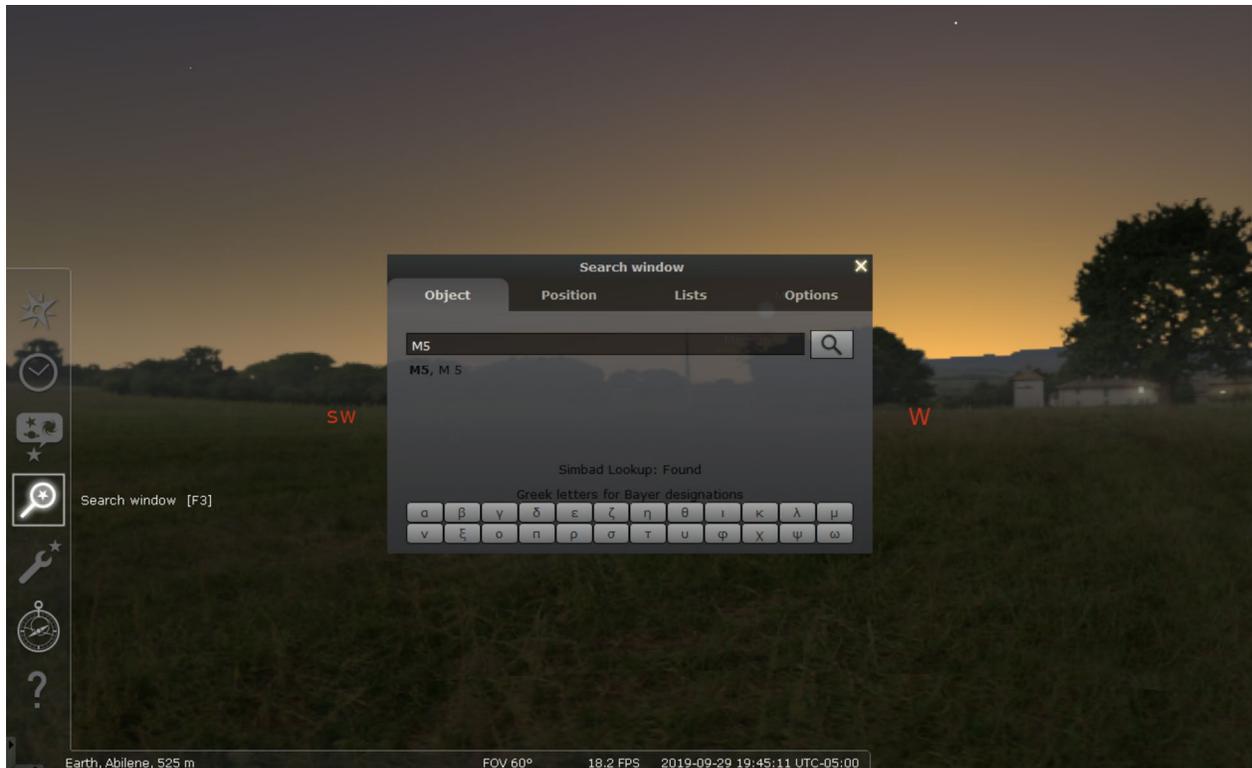
## Messier Object List

To image an object you will need to know its Right Ascension and Declination. We are going to use Messier objects as an example. Navigate to [https://en.wikipedia.org/wiki/Messier\\_object](https://en.wikipedia.org/wiki/Messier_object) and scroll down about a quarter of the way until you see the list. Find an object you would like to observe and write down its Messier number (etc. "M5").

Messier number	NGC/IC number	Common name	Picture	Object type	Distance (kly)	Constellation	Apparent magnitude	Right ascension	Declination
M1 <sup>[15]</sup>	NGC 1952	Crab Nebula		Supernova remnant	4.9–8.1	Taurus	8.4	05 <sup>h</sup> 34 <sup>m</sup> 31.94 <sup>s</sup>	+22° 00' 52.2"
M2 <sup>[16]</sup>	NGC 7089			Cluster, globular	33	Aquarius	6.3	21 <sup>h</sup> 33 <sup>m</sup> 27.02 <sup>s</sup>	-00° 49' 23.7"
M3 <sup>[17]</sup>	NGC 5272			Cluster, globular	33.9	Canes Venatici	6.2	13 <sup>h</sup> 42 <sup>m</sup> 11.62 <sup>s</sup>	+28° 22' 38.2"
M4 <sup>[18]</sup>	NGC 6121			Cluster, globular	7.2	Scorpius	5.9	16 <sup>h</sup> 23 <sup>m</sup> 35.22 <sup>s</sup>	-26° 31' 32.7"
M5 <sup>[19]</sup>	NGC 5904			Cluster, globular	24.5	Serpens	6.7	15 <sup>h</sup> 18 <sup>m</sup> 33.22 <sup>s</sup>	+02° 04' 51.7"

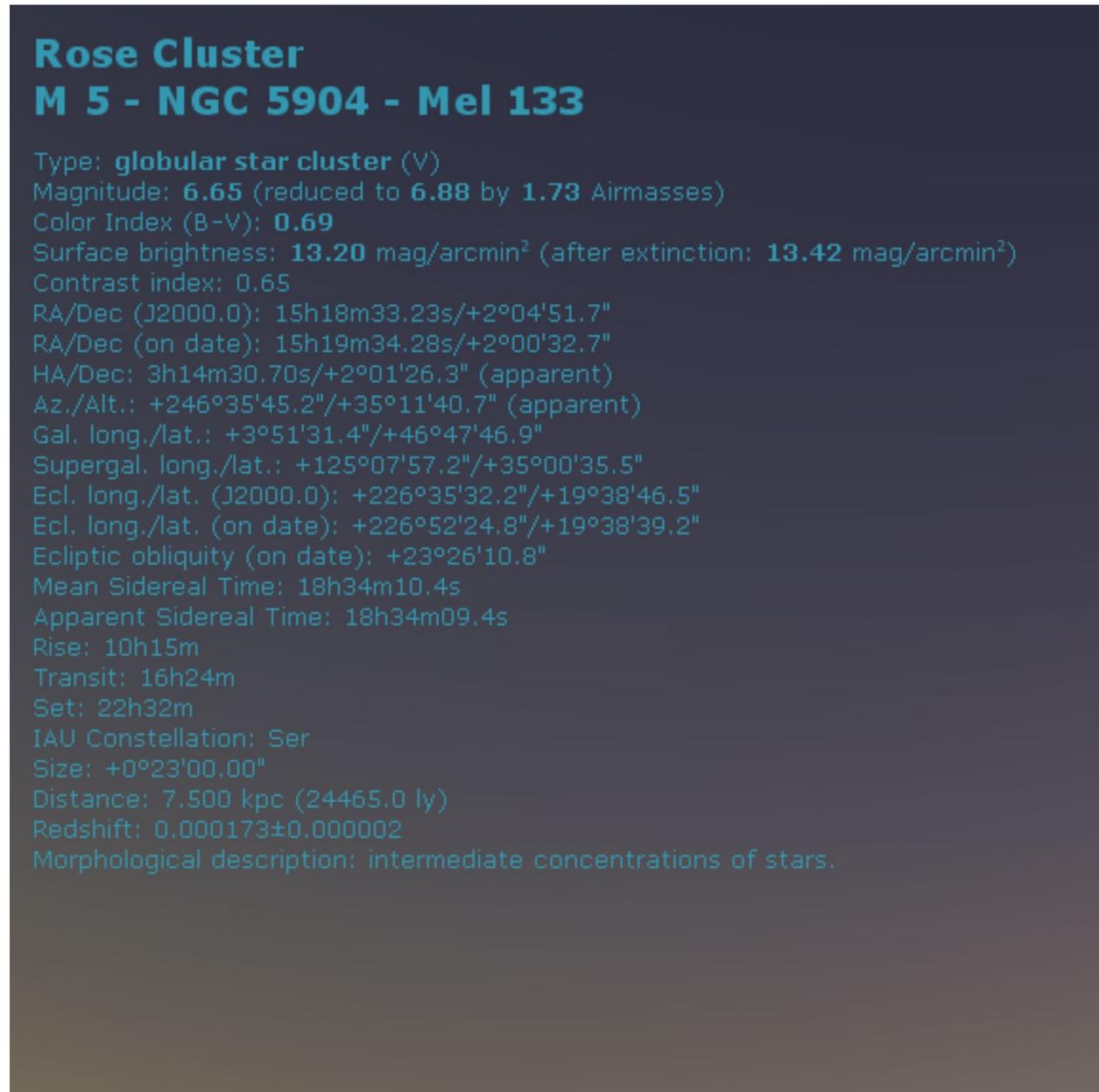
# Finding Right Ascension ("RA") and Declination ("Dec") Using Stellarium

Start Stellarium. Once it opens, all you have to do is to click on the search button on the left hand side of the screen (as your cursor gets closer to the left hand side, the search magnifying glass appears).



Then, enter, for example, M5 into the search box.

At the top left of the screen, RA and Dec appear (the 6th row down):



**Rose Cluster**  
**M 5 - NGC 5904 - Mel 133**

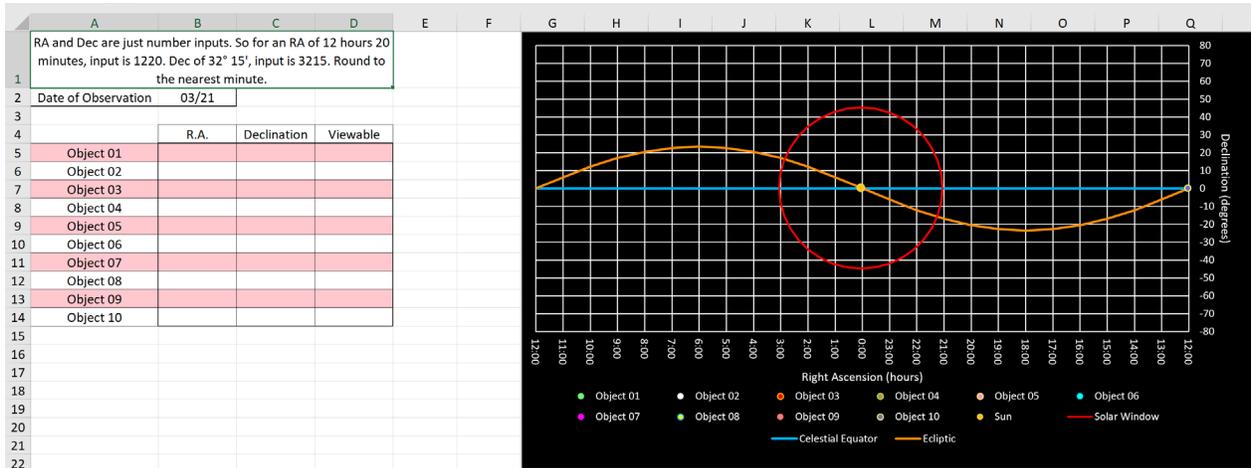
Type: **globular star cluster** (v)  
Magnitude: **6.65** (reduced to **6.88** by **1.73** Airmasses)  
Color Index (B-V): **0.69**  
Surface brightness: **13.20** mag/arcmin<sup>2</sup> (after extinction: **13.42** mag/arcmin<sup>2</sup>)  
Contrast index: 0.65  
RA/Dec (J2000.0): 15h18m33.23s/+2°04'51.7"  
RA/Dec (on date): 15h19m34.28s/+2°00'32.7"  
HA/Dec: 3h14m30.70s/+2°01'26.3" (apparent)  
Az./Alt.: +246°35'45.2"/+35°11'40.7" (apparent)  
Gal. long./lat.: +3°51'31.4"/+46°47'46.9"  
Supergal. long./lat.: +125°07'57.2"/+35°00'35.5"  
Ecl. long./lat. (J2000.0): +226°35'32.2"/+19°38'46.5"  
Ecl. long./lat. (on date): +226°52'24.8"/+19°38'39.2"  
Ecliptic obliquity (on date): +23°26'10.8"  
Mean Sidereal Time: 18h34m10.4s  
Apparent Sidereal Time: 18h34m09.4s  
Rise: 10h15m  
Transit: 16h24m  
Set: 22h32m  
IAU Constellation: Ser  
Size: +0°23'00.00"  
Distance: 7.500 kpc (24465.0 ly)  
Redshift: 0.000173±0.000002  
Morphological description: intermediate concentrations of stars.

Copy down these numbers.

# Observable Worksheet

The spreadsheet (created by James Timmons, Hardin-Simmons University) will inform you if the object is observable.

The center of the circle is the sun. The sun resides on the ecliptic. Any object within the circle is too close to the sun. In this case, we spread for a month or two months.



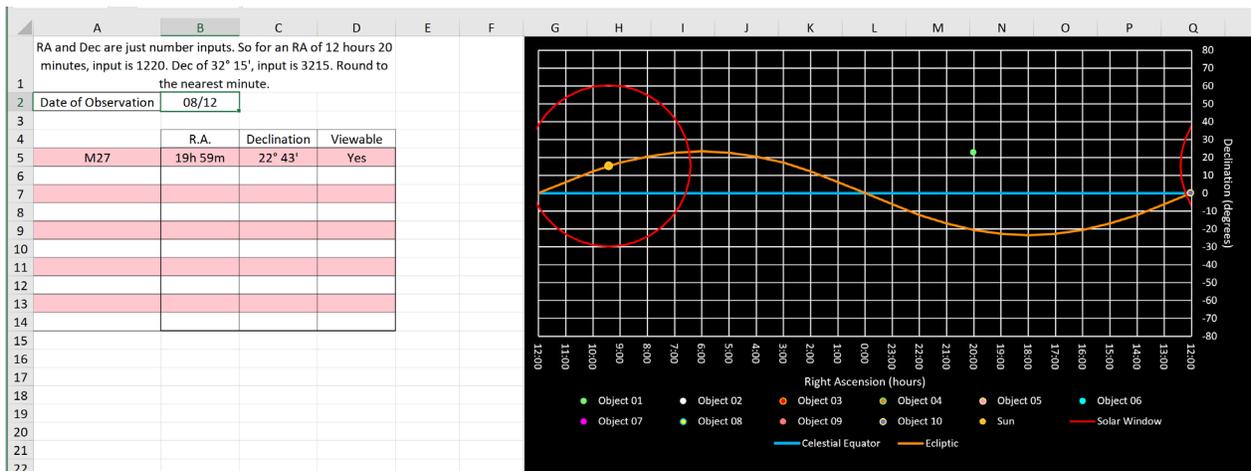
This worksheet will be available for use on the International Astronomical Search Collaboration (IASC) page) at [iasc.cosmosearch.org/Home/LCO](http://iasc.cosmosearch.org/Home/LCO)

# How to use the Worksheet

Lets start by searching for M27 using Stellarium and getting the Right Ascension and Declination.

**Note:** When filling in the Table, use the following format:

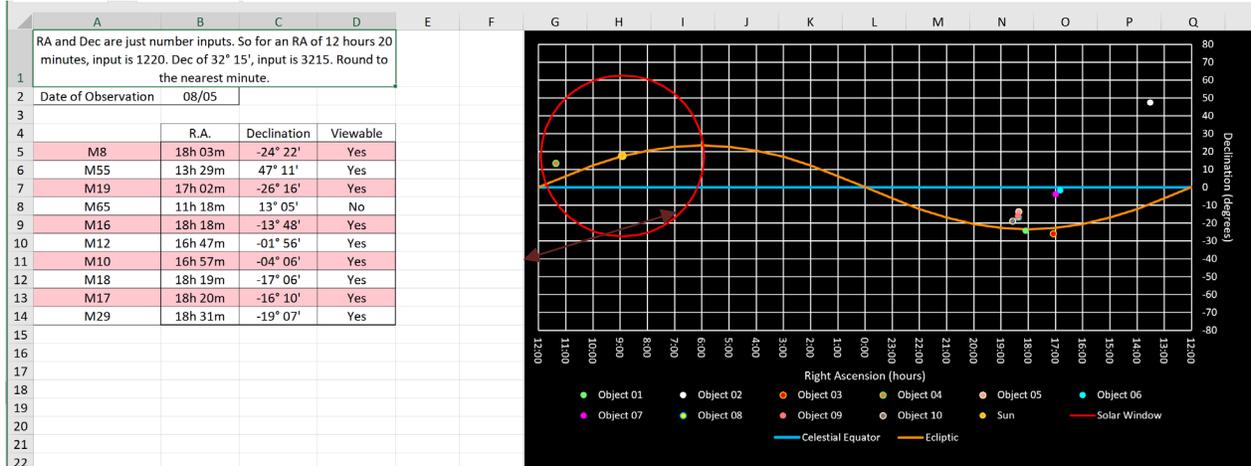
If the RA is 12h and 20 minutes and the Declination is 32° and 15 minutes, enter it as 1220 and 3215 respectively.



This table indicates that M27 is observable for 08/12/2019.

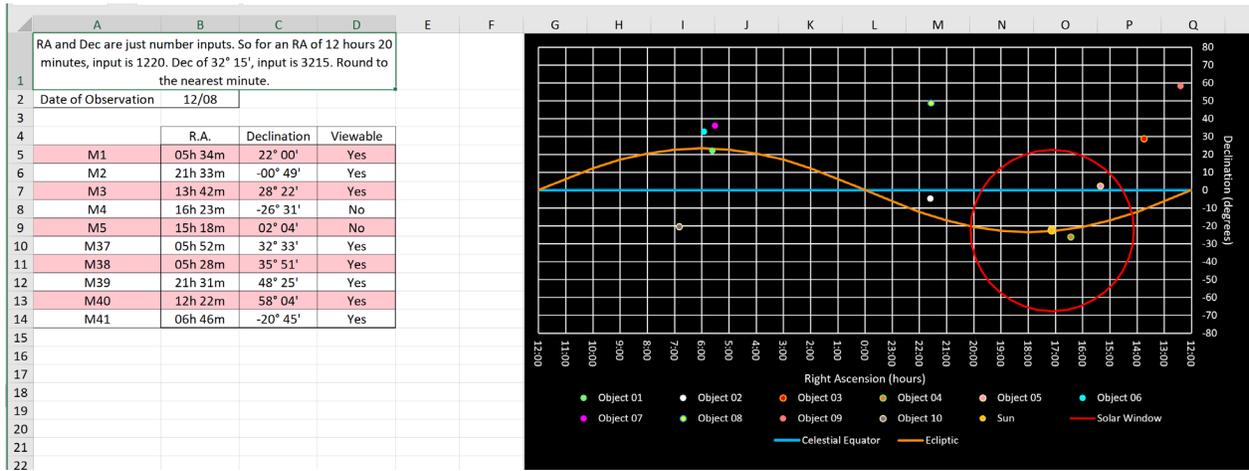
Here is an example of different Messier objects.

**Note:** that when the object is outside the circle the object will be visible, when it is inside the circle or near the sun the object will not be visible, so the image cannot be seen through the telescope.



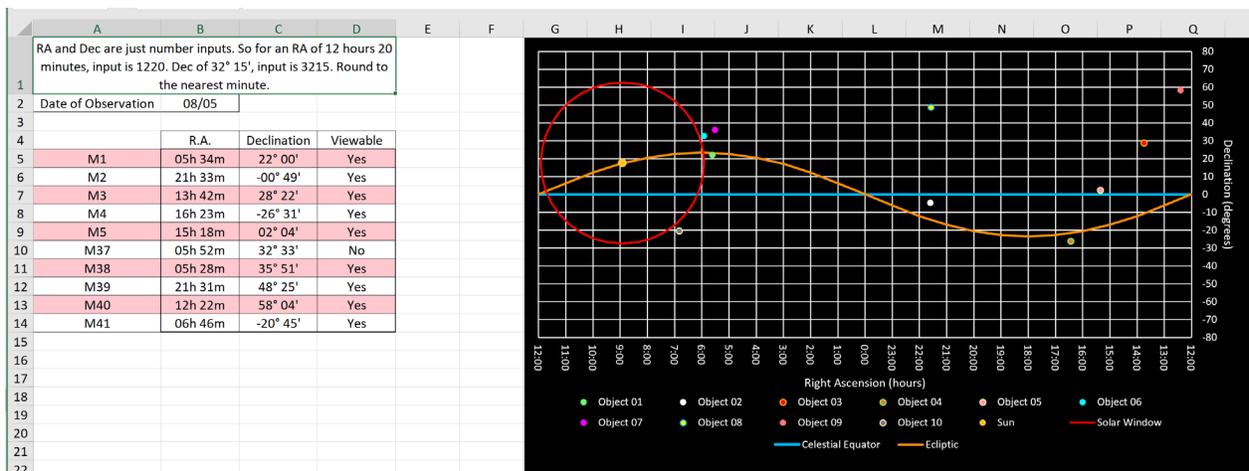
We can use the results to verify that the images are visible for the date 08/05/2019.

Here is another example of different Messier objects.



**Note:** object 04 and 05 are not visible for the date 12/08/2019.

Now, let's use the same images and change the date to see what happens.



**Note:** when the date was changed to 08/05/2019, only object 06 will not be visible for this day, in which case you will have to wait a few days or months for it to be visible to the LCO telescope.

# Go Discover

