



## Teacher Activity Packet: Observation Guide

[www.globe.gov/globeatnight](http://www.globe.gov/globeatnight)

March 16 - March 28, 2009

Encourage your students to participate in a world-wide citizen science campaign to observe and record the magnitude of visible stars as a means of measuring light pollution in a given location. Because the data collection occurs in the evening, this is an excellent opportunity to get parents involved in a learning activity with their child. Participants will learn how to locate the constellation Orion. They will learn stars have different magnitudes of brightness in the night sky and that this information is of interest to scientists studying light pollution. Using the information provided your students will collect data and report their findings to the GLOBE at Night online database. The data will then be analyzed and mapped for participants to see the results of this global campaign.

You may choose to have GLOBE at Night be a part of your planned curricula or a completely independent extracurricular activity. Note that an activity packet has been designed for parents and families to help them successfully participate with their child.

**Learning Objectives** - Students will be able to:

- Use latitude and longitude coordinates to report the location of their observation
- Locate the constellation Orion using stellar maps
- Determine the magnitude of the faintest visible stars in their location
- Analyze the spatial data collected
- Draw conclusions from studying the mapped observations

**Materials Needed:**

- GLOBE at Night Teacher or Family Activity Packet
- Something to write on (clipboard or cardboard)
- Something to write with (pencil or pen)
- Red light to preserve night vision (A red light can be made by covering a flashlight with a brown paper bag or red cellophane and securing the covering with a rubber band to be sure it doesn't slip while making the observation.)
- Optional: GPS unit, Maporama Web site ([www.maporama.com](http://www.maporama.com)) or topographic map to determine your latitude and longitude

Participation is open to anyone who lives or works in one of the 110 GLOBE countries listed on:  
[www.globe.gov/globeatnight/countries.html](http://www.globe.gov/globeatnight/countries.html)

**Five Easy Star-Hunting Steps:**

([www.globe.gov/globeatnight/observe.html](http://www.globe.gov/globeatnight/observe.html))

**1) Find your latitude and longitude**

by using any of the following methods:

- a. Use a GPS unit outside your location. Report as many decimal places as the unit provides.
- b. Visit <http://eo.ucar.edu/geocode/> on-line. Input your location. Or input your city; zoom in/out and pan around until you find your location. Double-click and the latitude and longitude will be displayed.
- c. Use topographic map of your area.
- d. Determine your latitude and longitude with the interactive tool when reporting observations on the GLOBE at Night Web site.

**2) Find Orion by going outside an hour after sunset** (approximately between 8-10 pm local time)

- a. Determine the darkest area by moving to where the most stars are visible in the sky toward Orion. If you have outside lights, be sure they are all off.
- b. Wait outside for at least 10 minutes for your eyes to adapt to the darkness. This is called becoming "dark-adapted."
- c. Locate Orion in the sky. For help use the appropriate Orion Finder Chart ([www.globe.gov/globeatnight/observe\\_finder.html](http://www.globe.gov/globeatnight/observe_finder.html)) for your latitude.

**3) Match your nighttime sky to one of our magnitude charts** (pages 3-4)

- a. Select the chart that most closely resembles what you are seeing.
- b. Estimate the cloud cover in the sky.
- c. Fill out the Observation Sheet (page 5).

**4) Report your observation online** at:

[www.globe.gov/globeatnight/report.html](http://www.globe.gov/globeatnight/report.html)

- a. Your observation can be recorded any time between March 16 - March 28, 2009.
- b. Do it again from a different location!

**5) Compare your observation** to thousands around the world at:

[www.globe.gov/globeatnight/analyze.html](http://www.globe.gov/globeatnight/analyze.html)



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### U.S. Education Standards:

This activity meets the following U.S. educational standards:

#### *National Science Education Standards*

Earth and Space Science Standards-

- K-4: Objects in the sky

Science in Personal and Social Perspectives-

- K-4: Changes in environments
- 5-8: Populations, resources, and environments, Science and technology in society
- 9-12: Environmental quality, Science and technology in local, national, and global challenges

#### *Mathematics Standards*

Numbers and Operations: Understand numbers, ways of representing numbers, relationships among numbers, and number systems

- Pre-K-2: Count with understanding and recognize "how many" in sets of objects; Understand and represent commonly used fractions, such as  $\frac{1}{4}$ ,  $\frac{1}{3}$  and  $\frac{1}{2}$
- 3-5: Develop understanding of fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers
- 6-8: Work flexibly with fractions, decimals, and percents to solve problems

Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems

- Pre-K-2: Recognize geometric shapes and structures in the environment and specify their location
- 3-5: Recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life
- 6-8: Recognize and apply geometric ideas and relationships in areas outside of the mathematics classroom,

such as art, science, and everyday life

*Geography for Life: The National Geography Standards*  
Essential Element 1: The World in Spatial Terms

- How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.
  - How to analyze the spatial organization of people, places, and environments on Earth's surface.
- Essential Element 5: Environment and Society
- How human actions modify the physical environment.

### Remember Safety First!

Please remind students of the following safety guidelines:

- Be sure you ask for permission from your parent(s) or guardian to go outside after dark to do this activity. This is designed to be a family activity, invite all your family members to do the activity with you.
- Depending on your location, be sure to wear suitable clothing for the weather and for being outside at night (light colored and/or with reflective colors).
- Remember safety first! When choosing the darkest area in your location, be sure the location is not close to traffic, the edge of a balcony, or near any other type of danger.

### Multiple Observations:

You can enter more than one observation by moving to a new location at least 1 km away from your original location. Don't forget to get new latitude and longitude coordinates. This can be done on the same night or on another night any time during March 16 - March 28, 2009.

**Note for higher latitudes (>45 N or S):** astronomical twilight will occur later and Orion will be low on the horizon; so you may need to do your observation closer to 9:00 pm rather than 8:00 pm or 10:00 pm.



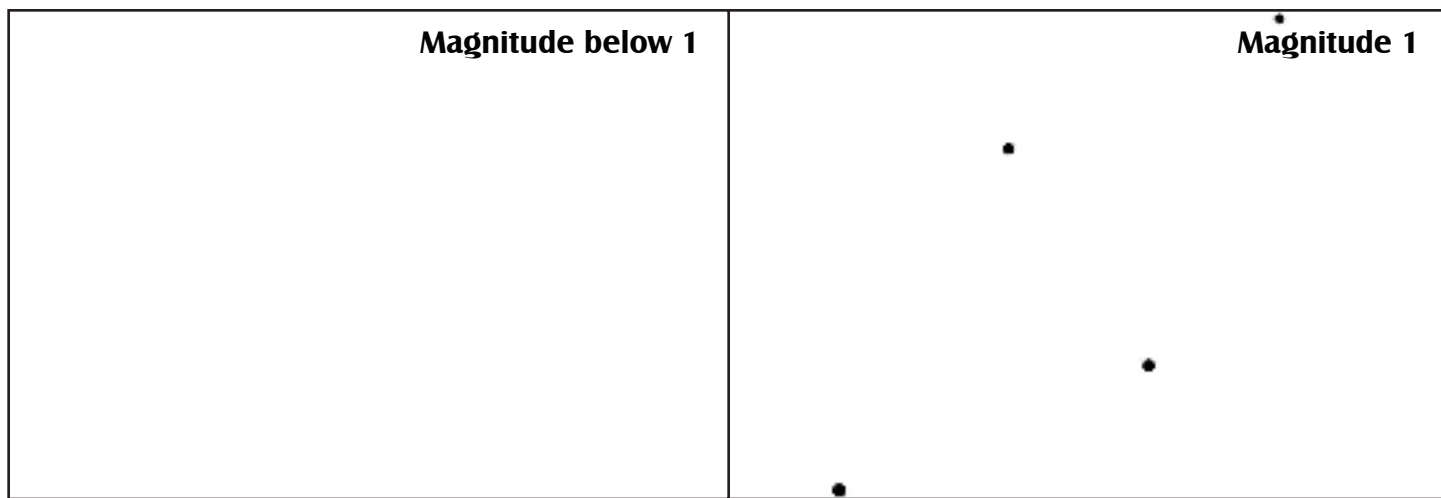
## Teacher Activity Packet: Magnitude Charts

[www.globe.gov/globenight](http://www.globe.gov/globenight)

March 16 - March 28, 2009

The following charts were generated with celestial North straight up.  
Please orient this page according to your location.

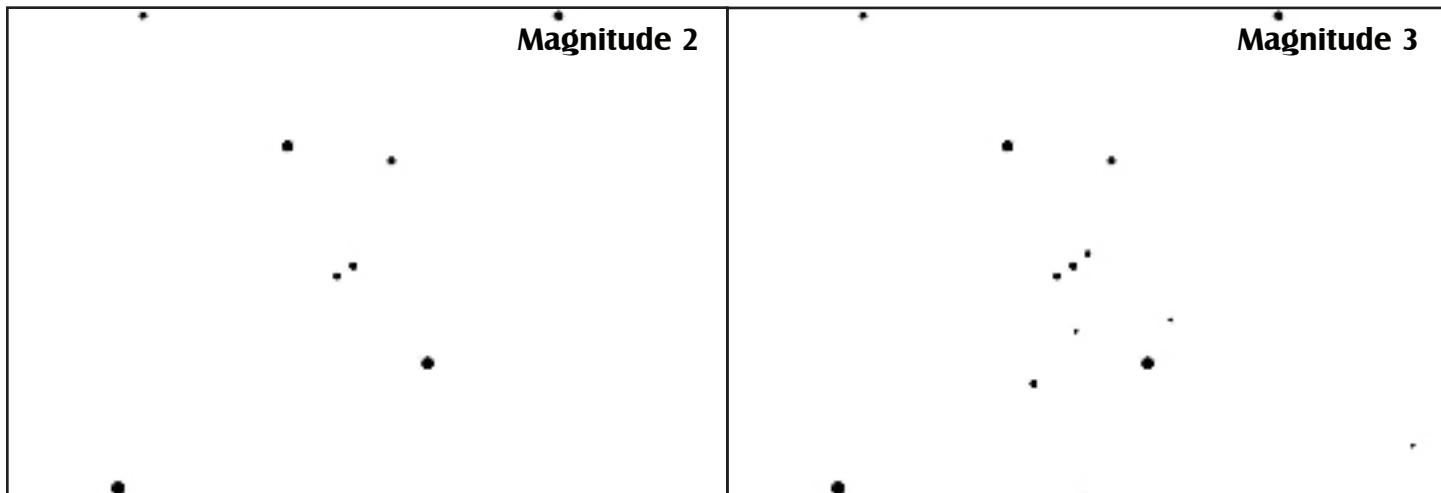
↑ Northern Hemisphere View ↑



Hint: You can't see Orion because he is hidden behind clouds.

Hint: You can only see a couple of the brightest stars in Orion.

Near Equator View  
←  
←



Hint: You can see two stars in Orion's belt.

Hint: You can see three stars in Orion's belt.

↙ Southern Hemisphere View ↙





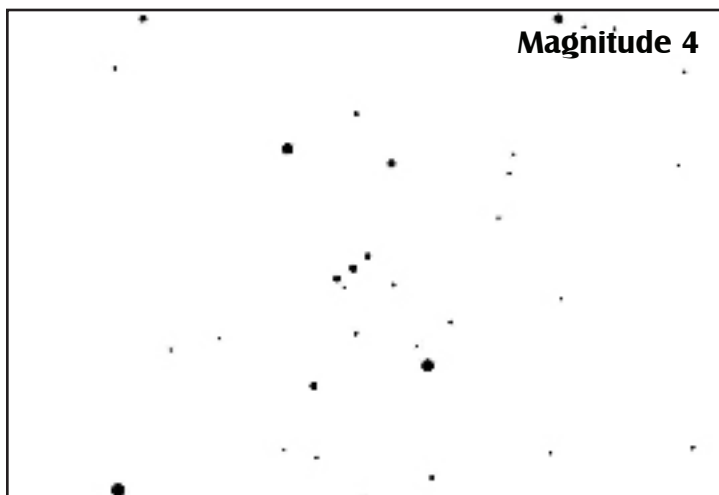
## Teacher Activity Packet: Magnitude Charts

[www.globe.gov/globeatnight](http://www.globe.gov/globeatnight)

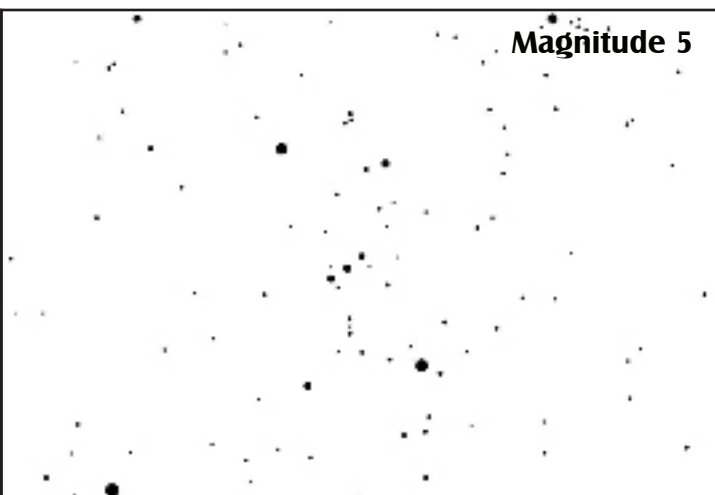
March 16 - March 28, 2009

The following charts were generated with celestial North straight up.  
Please orient this page according to your location.

↑ Northern Hemisphere View ↑

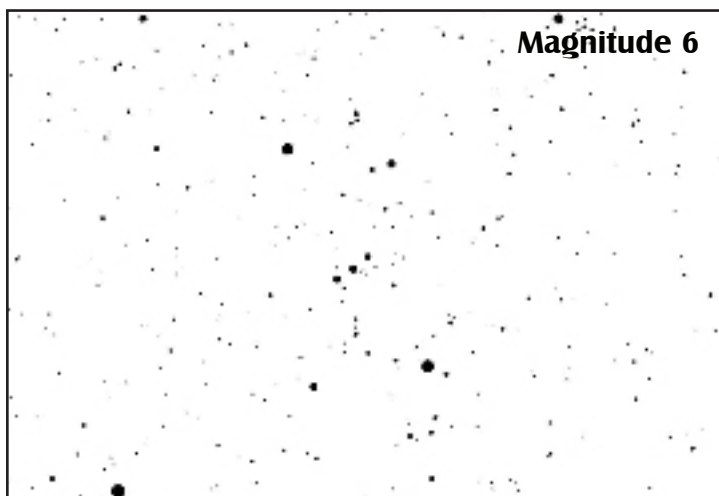


Hint: You can see four stars in Orion's belt.

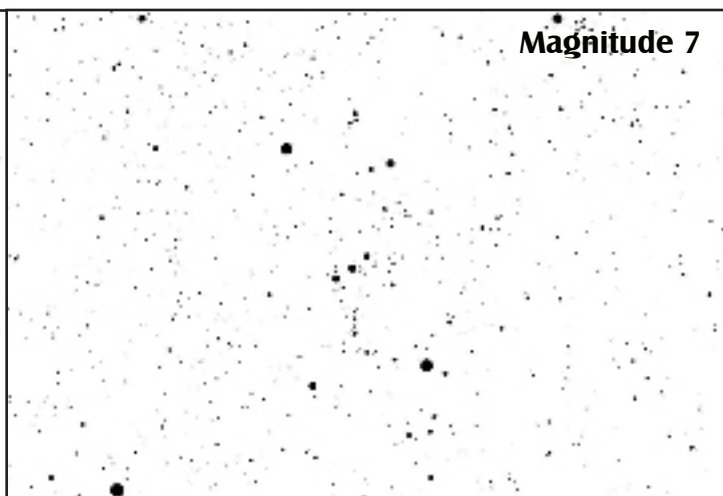


Hint: You can see six stars in Orion's belt, and also you might be able to see his sword.

Near Equator  
View  
←  
←



Hint: You can see many stars in Orion's belt, and his sword is clearly visible.



Hint: You can't count that many stars!

↙ Southern Hemisphere View ↙



## Teacher Activity Packet: Magnitude Charts

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March 16 - March 28, 2009

Only fields marked by \* are required.

\*Date: March \_\_\_\_\_, 2009

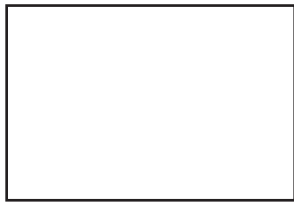
\*Observation Time: \_\_\_\_:\_\_\_\_ PM local time (HH:MM)      \*Country: \_\_\_\_\_

\*Latitude (in deg/min/sec \_\_\_\_ deg \_\_\_\_ min \_\_\_\_ sec  
or decimal degrees): \_\_\_\_\_ decimal degrees      (North / South)

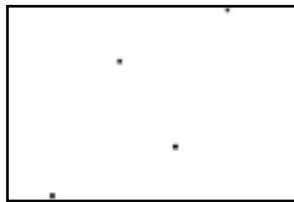
\*Longitude (in deg/min/sec \_\_\_\_ deg \_\_\_\_ min \_\_\_\_ sec  
or decimal degrees): \_\_\_\_\_ decimal degrees      (East / West)

Comments on location: (e.g. There is one street light within 50 m that is shielded from my view.)

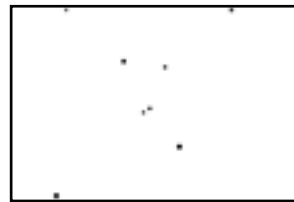
\*Match your nighttime sky to one of our magnitude charts :



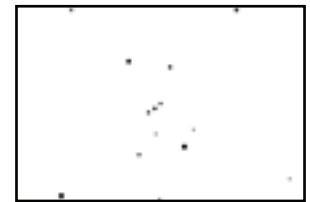
Stars in Orion  
not visible



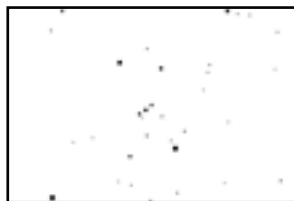
Magnitude 1 Chart



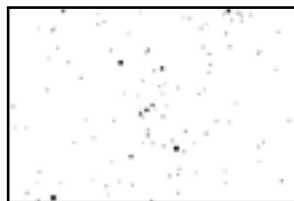
Magnitude 2 Chart



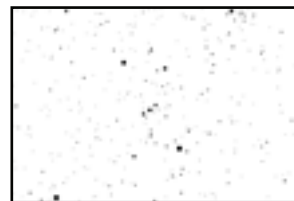
Magnitude 3 Chart



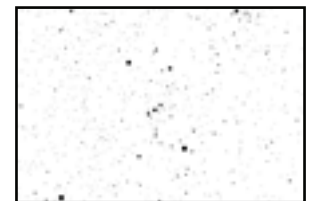
Magnitude 4 Chart



Magnitude 5 Chart



Magnitude 6 Chart



Magnitude 7 Chart

Reading from the Unihedron Sky Quality Meter (if applicable): \_\_\_\_\_

Serial number from the Unihedron Sky Quality Meter (if applicable): \_\_\_\_\_

\*Estimate the cloud cover in the sky:

Clear       Clouds cover 1/4 of sky       Clouds cover 1/2 of sky       Clouds cover > 1/2 of sky

Comments on sky conditions: (e.g. a little haze to the north)

Report online at [www.globe.gov/globeatnight/report.html](http://www.globe.gov/globeatnight/report.html)