



# ASTRONOMY

## Merit Badge Requirements

1) Do the following:

- A) Sketch the face of the moon, indicating on it the locations of at least five seas and five craters.
- B) Within a single week, sketch the position of the moon in the sky at the same hour on three different evenings. Explain the changes observed.
- C) Tell what factors keep the moon in orbit around the earth.

2) Do ONE of the following:

- A) Photograph or locate on a map of the sky a planet at approximately weekly intervals at the same time of night for at least 4 weeks. Explain any changes noticed on the photographs or map.
- B) Find out when each of the five visible planets will be observable in the evening sky during the next 12 months and compile this information in the form of a chart or table.

3) Do ONE of the following:

- A) In a sketch show the position of Venus, Mars, or Jupiter in the sky at approximately weekly intervals at the same time for at least 4 weeks.
- B) Using a compass, record the direction to the sun at sunset at approximately weekly intervals for at least 4 weeks in spring or fall (for 6 to 8 weeks in summer or winter) and relate this information to the seasons of the earth.
- C) With the aid of diagrams explain the relative positions of Sun, Earth, and Moon at the times of lunar and solar eclipses and at the times of New, First Quarter, Full, and Last Quarter phases of the moon.

4) Using the shadow of a vertical pole in sunshine, lay out a true north-south line (a meridian). Then, using a line and the pole on another day, measure the altitude of the noontime sun and determine your latitude.

5) Identify in the sky at least 10 constellations, four of which are in the Zodiac. Identify at least eight conspicuous stars, five of which are of first magnitude. Then do the following:

- A) Show in a sketch the position of the Big Dipper and its relation to the North Star and the horizon early some evening and again 6 hours later the same night. Record the date and time of making each sketch.
- B) Explain what we see when we look at the Milky Way.

6) With the aid of diagrams (or real telescopes if available) explain the difference between reflecting and refracting telescopes. Describe the basic purpose of a telescope and list at least three other instruments used with telescopes.

7) Do the following:

- A) Describe the composition of the sun, its relationship to other stars, and some effects of its radiation on the Earth's weather. Define sunspots and describe some of the effects they may have on this radiation.
- B) Identify at least one star that is red, one that is blue, and one that is yellow, and explain the meaning of those colors.

8) Do ONE of the following:

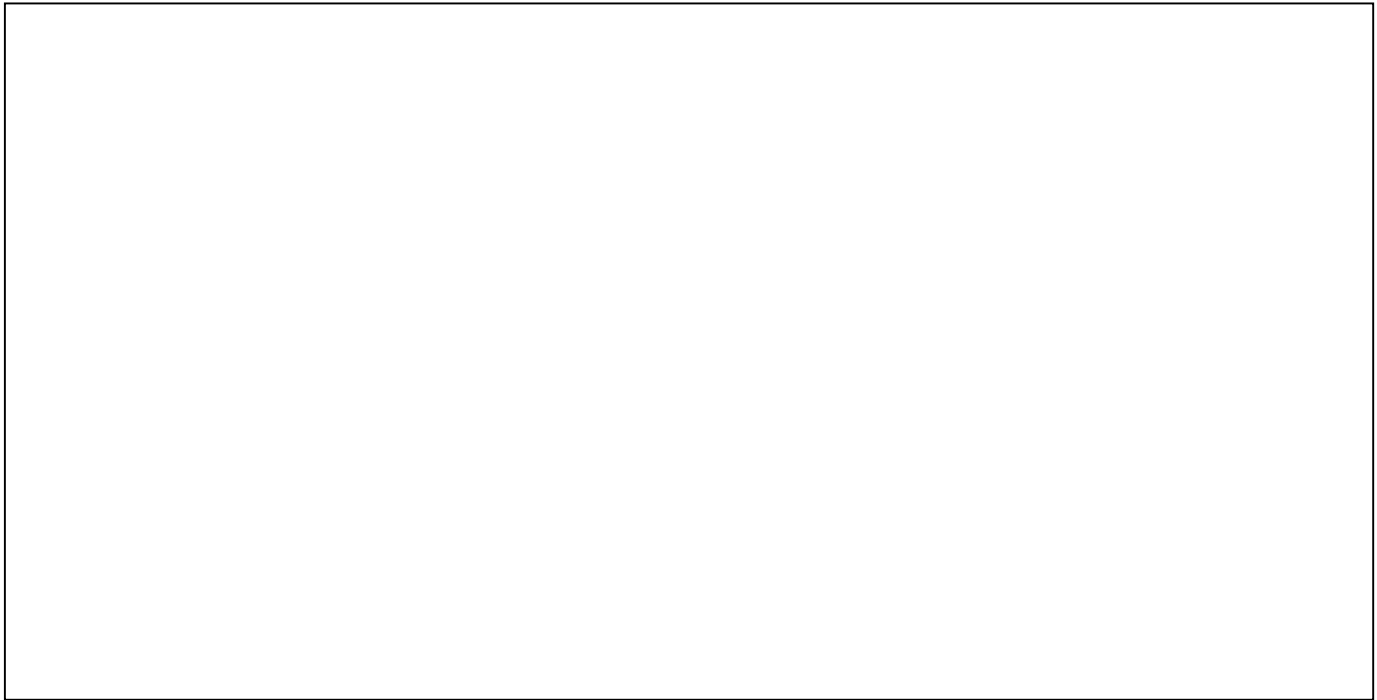
- A) Visit a planetarium or observatory and submit a report to your counselor both on the activities occurring there and on the exhibits of instruments and other astronomical objects you observed.
- B) Spend at least three hours observing celestial objects through a telescope or field glass, and write a report for your counselor on what you observed.

9) Name different career opportunities in astronomy. Explain how to prepare for one of them. List the high school courses most useful in beginning such preparation.

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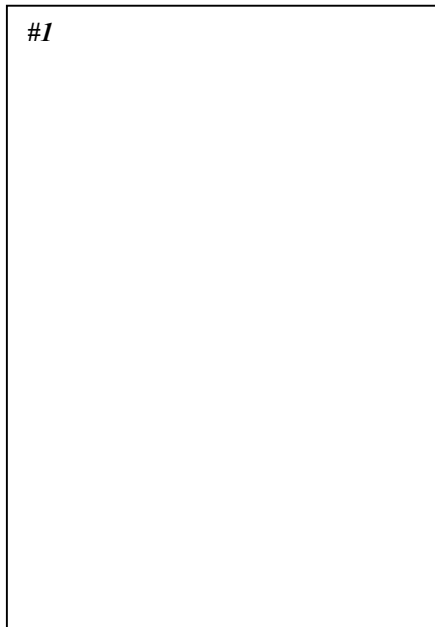
**Requirement 1**

Use the area below to make a sketch of the face of the moon. On your sketch indicate the locations of at least five seas and five craters:



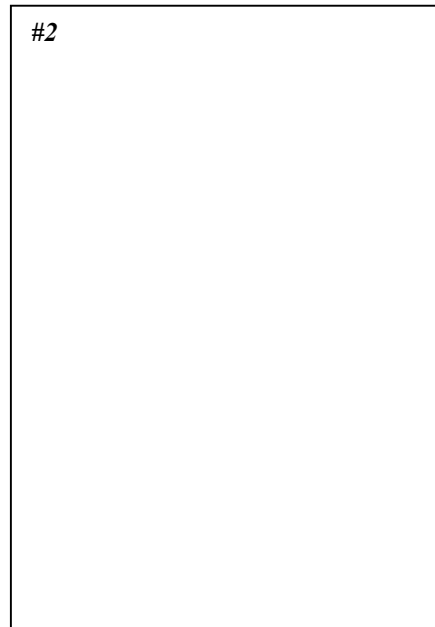
During a one week period sketch the position of the moon in the sky at the same hour.

#1



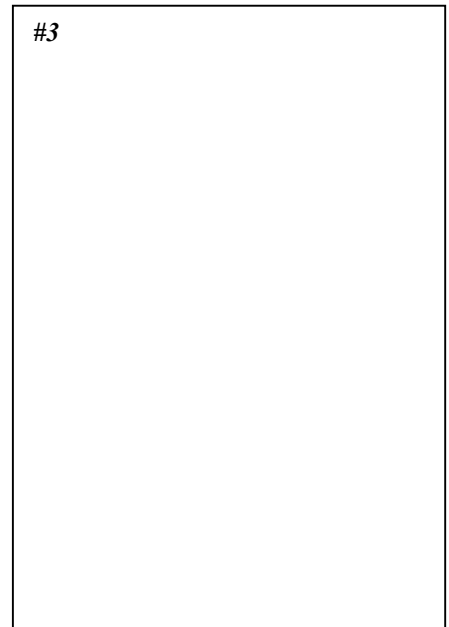
Day: \_\_\_\_\_ Time: \_\_\_\_\_

#2



Day: \_\_\_\_\_ Time: \_\_\_\_\_

#3



Day: \_\_\_\_\_ Time: \_\_\_\_\_

What changes did you observe? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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Tell what factors keep the moon in orbit around the earth: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Requirement 2

You have been give two options for this requirement. Select and complete ONE of them.

If you selected *Option A*:

Photograph or locate on a map of the sky a planet at approximately weekly intervals at the same time of night for at least 4 weeks. Attach your photographs or map(s) to this worksheet.

Label your photographs or map(s) according to the week it was taken or used. Record the following information.

Week 1

Date observation made: \_\_\_\_\_ Planet observed: \_\_\_\_\_ Time observation made: \_\_\_\_\_

Week 2

Date observation made: \_\_\_\_\_ Planet observed: \_\_\_\_\_ Time observation made: \_\_\_\_\_

Week 3

Date observation made: \_\_\_\_\_ Planet observed: \_\_\_\_\_ Time observation made: \_\_\_\_\_

Week 4

Date observation made: \_\_\_\_\_ Planet observed: \_\_\_\_\_ Time observation made: \_\_\_\_\_

Explain any changes noticed on the photographs or map(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If you selected *Option B*:

Find out when each of the five visible planets will be observable in the evening sky during the next 12 months and compile this information in the chart below. Write the name of the planet in the top row. Under each planet indicate the dates/times/etc when that planet is observable. You may use the chart on the following page or make up one of your own and attach it to this worksheet.

	PLANETS				
<b>January</b>					
<b>February</b>					
<b>March</b>					
<b>April</b>					
<b>May</b>					
<b>June</b>					
<b>July</b>					
<b>August</b>					
<b>September</b>					
<b>October</b>					
<b>November</b>					
<b>December</b>					

**Requirement 3**

You have been given three options for this requirement. Select and complete ONE of them.

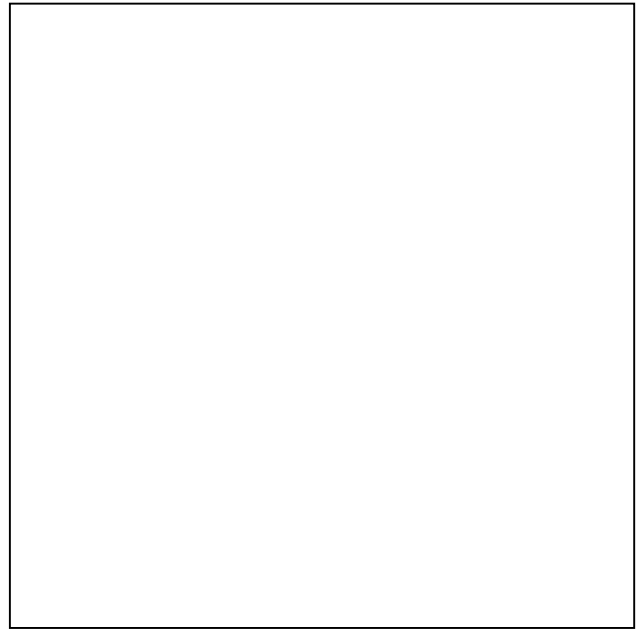
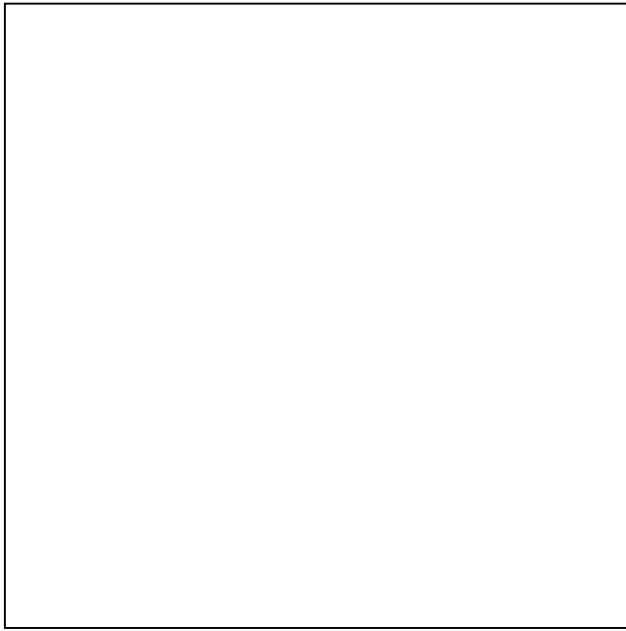
If you selected *Option A*:

In a sketch show the position of Venus, Mars or Jupiter in the sky at approximately weekly intervals at the same time for 4 weeks.

Planet: \_\_\_\_\_ Date: \_\_\_\_\_

Planet: \_\_\_\_\_ Date: \_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_



Planet: \_\_\_\_\_ Date: \_\_\_\_\_

Planet: \_\_\_\_\_ Date: \_\_\_\_\_

If you selected **Option B**:

Using a compass, record the direction to the sun at sunset at approximately weekly intervals for at least 4 weeks in spring or fall (for 6 to 8 weeks in summer or winter. Relate your information gathered to the seasons of the earth.

**Week 1**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Week 2**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Week 3**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Week 4**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Week 5**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Week 6**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

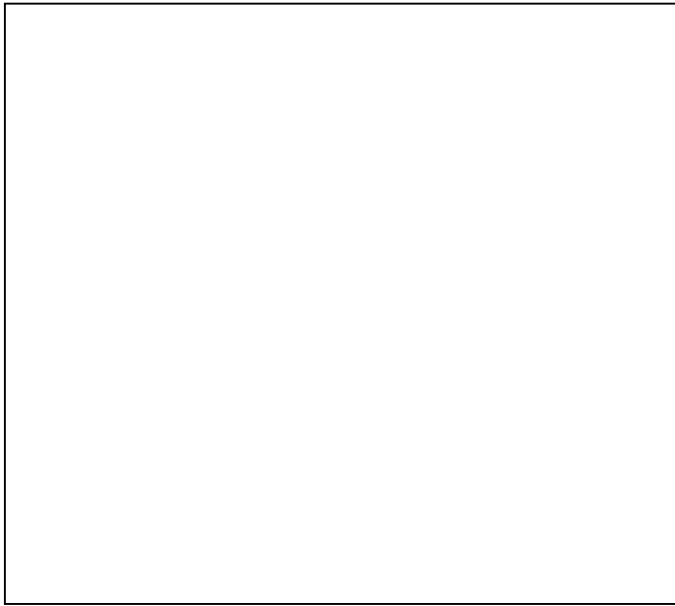
**Week 7**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

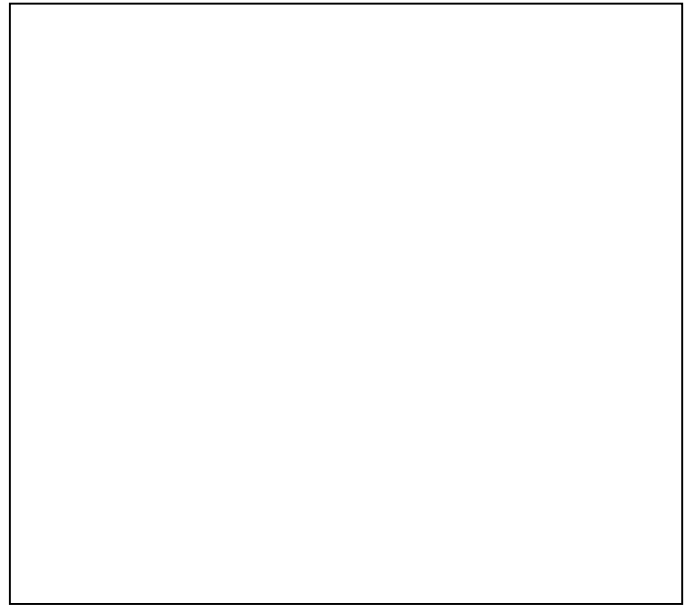
**Week 8**

Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

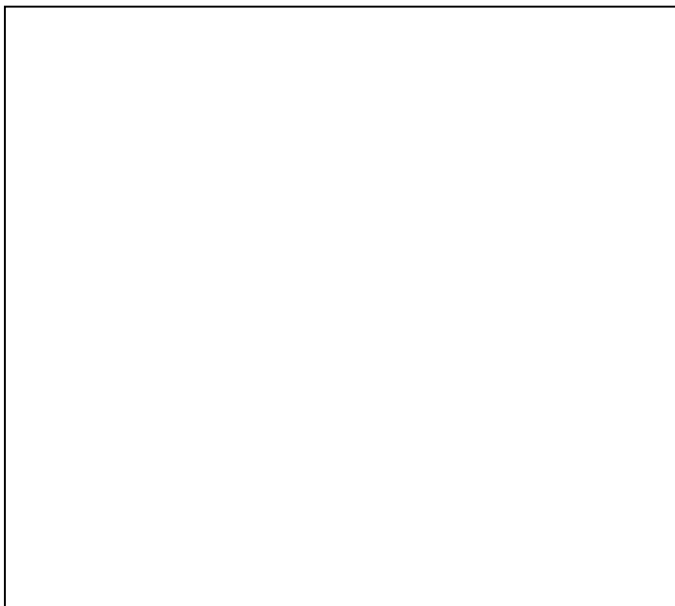




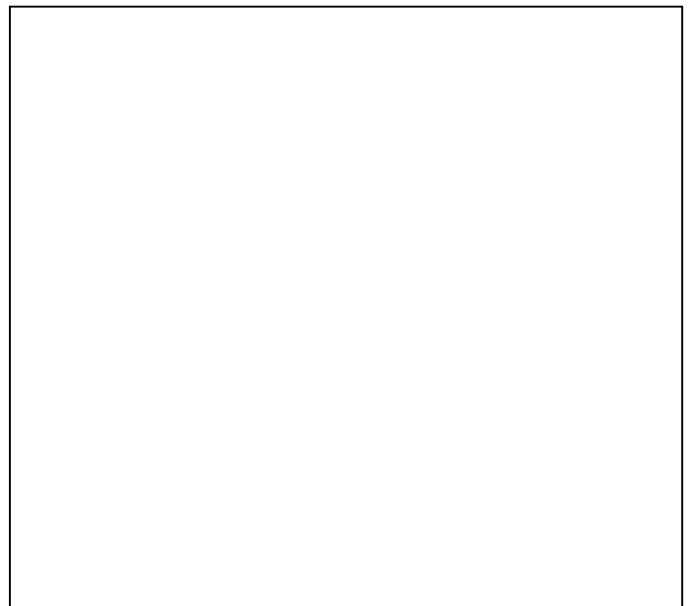
Lunar Eclipse



Solar Eclipse



First Quarter



Last Quarter

### Requirement 4

For this requirement you are asked to lay out a true north-south line (a meridian) by using the shadow of a vertical pole. After doing this show your line to your counselor. Briefly describe the process: \_\_\_\_\_

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On a different day, measure the altitude of the noontime sun and determine your latitude.

Altitude of sun: \_\_\_\_\_

Your latitude: \_\_\_\_\_

Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

Briefly describe the process of figuring the altitude of the sun and determining your latitude: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Requirement 5

Identify in the sky at least 10 constellations, four of which are in the Zodiac. List the constellations you identified. Circle the four that are in the Zodiac:

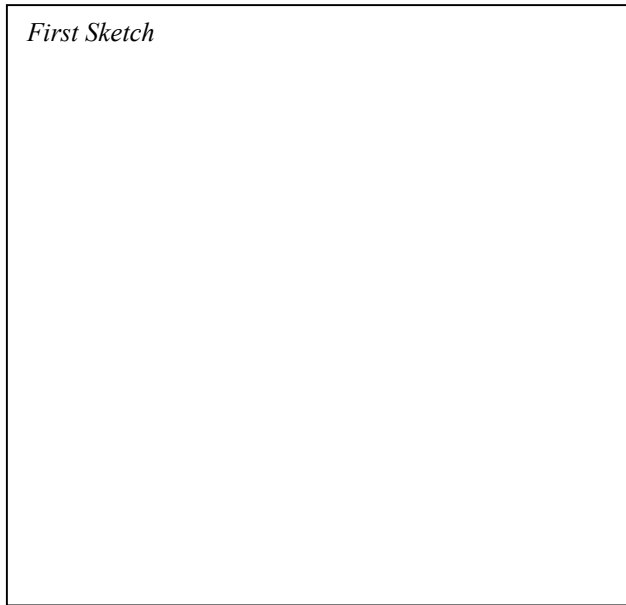
\_\_\_\_\_  
\_\_\_\_\_

Identify at least 8 conspicuous stars, five of which are of first magnitude. List the stars you identified. Circle the five that are of first magnitude. \*Extra mile (not required for badge): find two other stars and list them.

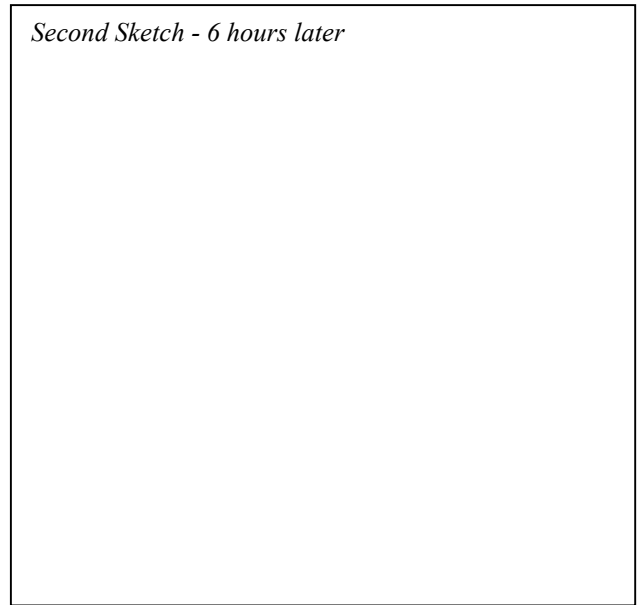
\_\_\_\_\_  
\_\_\_\_\_ \* \_\_\_\_\_ \*

Sketch the position of the Big Dipper and its relation to the North Star and the horizon early in the evening. Make a second sketch of the same thing 6 hours later that same night:

*First Sketch*



*Second Sketch - 6 hours later*

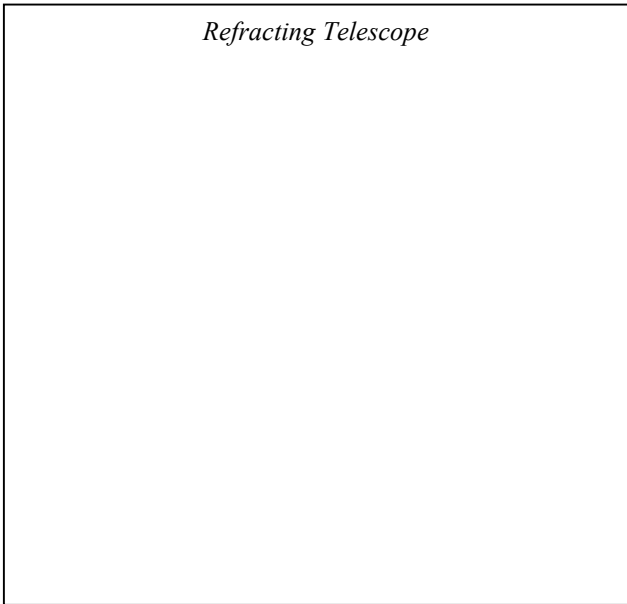
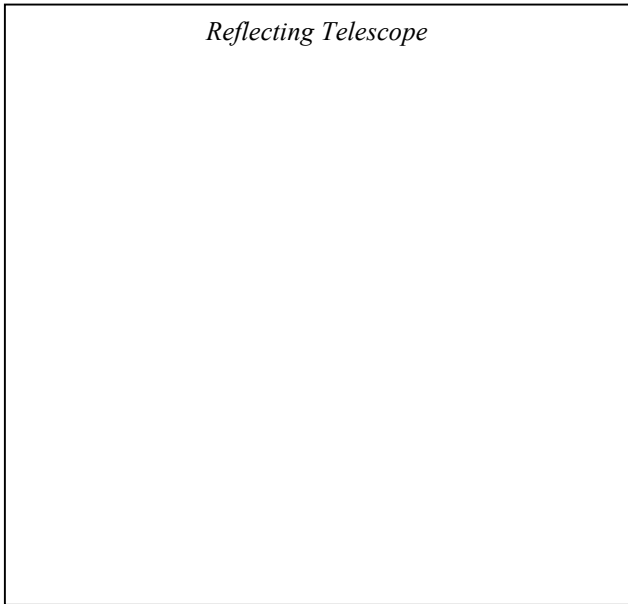


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Explain what we see when we look at the Milky Way: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Requirement 6**

Explain the difference between reflecting and refracting telescopes. Draw a diagram of each to support your explanation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



What is the basic purpose of a telescope? \_\_\_\_\_  
\_\_\_\_\_

List three other instruments used with telescopes:

\_\_\_\_\_

**Requirement 7**

Describe the composition of the sun: \_\_\_\_\_  
\_\_\_\_\_

Describe the sun's relationship to other stars: \_\_\_\_\_  
\_\_\_\_\_

What effects does the sun's radiation have on the Earth's weather? \_\_\_\_\_  
\_\_\_\_\_

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Define sunspots: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Describe some of the effects sunspots may have on the radiation hitting the Earth: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Identify a red, blue, and yellow star. Explain the meaning of the colors. Use the area below to record your answers.

**Red Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_

**Blue Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_

**Yellow Star:**

Name of Star (if known) or description of location: \_\_\_\_\_

What does the color mean? \_\_\_\_\_  
\_\_\_\_\_

**Requirement 8**

For this requirement you have been given two options. Select and complete ONE of them.

If you selected **Option A:**

Visit a planetarium or observatory and submit a report to your counselor both on the activities occurring there and on the exhibits of instruments and other astronomical objects you observed. Use the area below to take notes on your visit. Attach a copy of your report to this worksheet.

What activities did you see occurring at the planetarium? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What exhibits of instruments did you see? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What other astronomical objects did you observe? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Scout Name: \_\_\_\_\_ Unit #: \_\_\_\_\_ Date: \_\_\_\_\_

### Requirement 9

Use the spaces below to list several different careers in astronomy:

_____	_____	_____
_____	_____	_____
_____	_____	_____

Pick one career and explain how you would prepare for it: Career: \_\_\_\_\_

Preparation needed: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

List some of the high school courses most useful in beginning such a preparation:

_____	_____	_____
_____	_____	_____
_____	_____	_____