# Astronomy 2007

# Mr. Miller Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Introduction to Starry Night - Worksheet

## Getting Information

Set Starry night to display the sky on January 1st of this year at 10 PM from Portland. Stop the time flow.

1. What constellations are visible over the eastern horizon? (Name the major ones) (Reminder: the constellation labels are under the options tab, press the ‘e’ key to turn and face east)
2. Identify Procyon in Canis Minor. What time did it rise? (Reminder: pointing with the adaptive pointer gives you information, you can use command (apple) + f or the find tab to find things.)

Find Ursa Major (the Big Dipper). Zoom in on the middle 'star' in the handle of the dipper until you can see it is really a double star, Alcor and Mizar. Hold the pointer over one star and then the other; this brings up the information box. (Reminder: you can right click/ctrl +click and center, then use the + button in the zoom area of the toolbar to zoom in)

1. Are they both the same distance away from Earth? Yes / No (circle one)

Click and drag from one star to the other.

1. What is the angular separation of these two stars? This is close to the resolution limit of the human eye.

Zoom back out until you can see whole constellations again. Face south and find Orion. Turn on the Celestial Guides grid and equator to show the lines of Right Ascension and Declination. Record the RA and Dec for Rigel and Betelgeuse, two prominent stars in Orion. (Hint: The information the pointer gives you about each star will tell you the coordinates of the star, too. Be sure to include the direction of the declination, i.e. +/North or -/South).

|  |  |  |
| --- | --- | --- |
| **Star** | **RA** | **dec** |
| Rigel |  |  |
| Betelgeuse |  |  |



Note that from these declinations the Celestial Equator (at 0º declination) must pass through Orion. What is the name of the star in Orion's belt that is closest to the Celestial Equator? What are its RA and Dec?

|  |  |  |
| --- | --- | --- |
| **Star** | **RA** | **dec** |
|  |  |  |

You know Polaris, in Ursa Minor, is the star presently closest to the north celestial pole. Find Polaris. Record its altitude along with the latitude and longitude of the viewing location for Portland, Oslo Norway, and Honolulu Hawaii in the table below. (Hint: The latitude and longitude are in the box that allows you to change your Viewing Location. Reminder: to change your location, click the down arrow in the “Viewing Location” area of the toolbar).

|  |  |  |  |
| --- | --- | --- | --- |
| **Location** | **City Longitude** | **City Latitude** | **Altitude of Polaris** |
| Portland |  |  |  |
| Oslo, Norway |  |  |  |
| Honolulu, Hawaii |  |  |  |

1. Explain why Polaris's altitude above the horizon changes like this -- a diagram may be helpful.

## Seasons

Now reset your location to Portland. Turn off the RA and dec lines, but leave the celestial equator on. Turn on the ecliptic (Reminder: that’s “equator” under “Ecliptic Guides” in the options tab.) Turn on the constellation boundaries. Uncheck Daylight under Local View. Find and center on the Sun.

1. In what constellation is the sun at the winter Solstice (Dec 21)? You may need to change the time of day and the date. (Reminder: click the things you want to change in the “Time and Date” area of the tool bar)

Record the distance between the Earth and the Sun on December 21 in the table below (Hint: the distance between the observer and the Sun is the same as the distance between the planet the observer is on and the Sun!). Also record the Right Ascension and Declination of the Sun. Repeat the above measurements for the summer solstice (June 21) and record those values in the table.

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Earth-Sun Distance (AU)** | **Right Ascension** | **Declination** |
| Dec 21 |  |  |  |
| June 20 |  |  |  |

1. What does the above information suggest about what is the cause of seasons on the Earth -- and what is not the cause?

## The Ecliptic and the Celestial Equator

Go to Now, turn daylight off, and turn on the Ecliptic (View Menu: Ecliptic Guides: Ecliptic) and Celestial Equator (View Menu: Celestial Guides: Celestial Equator). Set the time to Noon today and your location to Portland.

1. Where is the Sun with respect to both the Ecliptic and the Celestial Equator?
2. Based on your answer to the previous question, what “celestial event” is taking place right now?

Set the time flow to Days (solar, not sidereal). Click on the Sun and select Center so that you track the sun. Now click play to run time forward, and watch the movement of the sun for an entire year’s worth of time.

1. Does the Sun ever move off of the Ecliptic? Yes/No (circle one)
2. At what time(s) of year does the Sun reach its maximum distance from the Celestial Equator?
3. What name do we give to this/these time(s)?

Now go back to Noon today. Make sure the Sun is still centered. Click on the sun and make sure that “Local Path” is selected. Make sure the time flow is still Days, and click the play button. Watch for a year’s worth of time.

1. Draw the shape that the Local Path of the Sun makes in the sky when viewed at the same clock time every day (such as Noon for the entire year).
2. What is the shape called?

## Planets and Time

You now want to look at the motion of the planets in the sky relative to the Sun. Set the time to noon, today. Set the time flow rate to one day. Make sure daylight is still off. Under the find tab, clear anything in the search bar so you get the list of solar system objects. Click the arrow next to the Sun and choose “Centre” to center the display on the Sun; Click the check box next to Mercury to label it. Set the sky in motion and observe Mercury's path. After watching how it moves, return to today at noon, click the checkboxes next to the other planets so you can track them, and answer the following questions. You may want to step time forward to make all the observations. Restrict your answers to the time period of 6 months from today.

1. On what day does Mercury appear closest to the Sun (i.e. in angular distance)?
2. What other planet(s) do you see nearby when Mercury is closest to the Sun?
3. On what day does Mercury appear farthest from the Sun? (This is known as greatest elongation.)
4. What other planet(s) do you see nearby?

Set the sky running and watch as Mercury and the other planets exhibit retrograde motion. Reset the date and set the time to noon today. Look towards the south. Using a time increment of 1 day, set the sky in motion.

1. What do you observe the stars and the sun doing?
2. Try centering the display on a planet or the moon, as you did with the Sun above, and describe what happens when a planet goes through retrograde.

Return to noon today, and face south. Change the time increment to "Sidereal d.'' which is the sidereal day: 23h 56m. Set Starry Night running again.

1. What do you observe now? Why does this differ from before, when you used a solar day?

## The Zodiac

The zodiac constellations are the constellation the Sun passes through over the course of the year.

For the next few questions, set Starry Night to your birthplace location, as well as birthdate and approximate time (make it noon if you have no idea what the time is.) You will need the constellation boundaries on, and having the ecliptic on may be helpful.

Location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date and Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. In what constellation was the Sun located on the day of your birth? Does this match your astrological sign? What does this mean for astrology?
2. In what constellation was the Moon located on the day of your birth? What was the phase of the moon? (Draw it).

## Planning an Observing Session

Set Starry Night to the present location (Portland) and date, and set the time to 9:00 PM.

1. Which planets in our solar system might we look for in the Portland evening sky this week between sunset and 11 PM?
2. Are there any other interesting objects one might want to look at through a telescope? (Hint: Try turning on the buttons for different things like nebulae and galaxies, then zooming in towards various objects.)