AST101: Right Ascension and Declination Worksheet

Examine the rectangular star map. It represents the entire celestial sphere as a rectangle. Distortions occur when a 3D sphere is drawn as a flat rectangle. The distortions are severe near the top and bottom of the map. You will notice slightly odd shapes elsewhere, for instance, the Big Dipper and Cassiopeia. The distortion is quite workable for most purposes in the center 2/3rds of the map. It's similar to the rectangular maps of the earth that grossly distort the landmasses near the north and south poles, but work fine for the major populated areas closer toward the equator.

The line running horizontally through the center of the star map represents the celestial equator. Right ascension (RA) is measured (in what units?) along this line from *right to left.* Notice the right ascension scales at the top and bottom of the map.

Declination (dec) is measured (in what units?) perpendicular to the celestial equator. The scales are on the left and right edges of the map.

Compare the coordinates listed on the Brightest Stars chart with those stars' positions on the map to make certain you understand how this celestial coordinate system works and then answer the questions that follow.

1. Find on the map the "topmost" star of the constellation Libra. What is its right ascension, to the nearest 15 minutes, as read from the map?

   What is the declination of that same star, to the nearest 2 degrees?

2. The sun's location at the first day of each season (northern hemisphere) is giving in the table below. Plot its position on the rectangular star map for each date and label it with the season.

Season	RA	Declination
Autumn	12h 0m	0°
Winter	18h 0m	-23.5°
Spring	0h 0m, or 24h 0m	0°
Summer	6h 0m	+23.5°

3. Fill in the table below with the constellation closest to the sun's position (that is, the constellation the sun is "in") and the constellation closest to the opposite point in the sky (opposite the sun) on each of the seasonal positions.

Season	Sun "in"	Opposite sun
Autumn	_____	_____
Winter	_____	_____
Spring	_____	_____
Summer	_____	_____

4. Now that the four principal seasons are plotted, imagine where the sun might be on dates between these points. For example, what are the approximate RA and dec of the sun on October 22? How about May 21?

Date	RA	Dec
October 22	_____	_____
May 21	_____	_____

The sun always appears on the imaginary line called the ecliptic. The ecliptic can be also thought of as tracing the plane of the earth's orbit. Label the ecliptic on the map.

5. The following table lists the celestial coordinates for the major planets on September 24, 2004. Plot the planet positions on the map and label each planet. Try to use a different color pen than the sun plotting.

Planet	RA	Dec
Mercury	11h 32m	+5°
Venus	9h 25m	+15°
Mars	11h 56m	+1°
Jupiter	12h 01m	+1°
Saturn	7h 50m	+21°

6. In the following table, fill in the constellation closest to each planet's position on September 24, 2004:

Planet	Constellation
Mercury	_____
Venus	_____
Mars	_____
Jupiter	_____
Saturn	_____

7. What can you conclude about the position of the planets relative to the plane of the earth's orbit?

8. The following table lists the moon's coordinates at 5-day intervals for the next month. Plot the moon's position on the map and label each position with the date. Use a different color pen for this, if possible.

Date	RA	Dec
9/24/04	20h 23m	-25°
9/29	0h 46m	+3°
10/4	4h 51m	+26°
10/9	9h 14m	+21°
10/14	13h 14m	-7°
10/19	18h 02m	-28°

9. In the following table, fill in the constellation closest to each moon position. What can you conclude about the moon's orbit relative to the plane of the earth's orbit?

Date	Constellation
9/24/04	_____
9/29	_____
10/4	_____
10/9	_____
10/14	_____
10/19	_____