Name _____  Date _____

Seasonal Arc Paths of the Sun

(As viewed from Syosset, NY)

So where are we now? We have already explored the concepts of altitude and azimuth and we have recently begun to explore seasonal changes on the Earth. Well, just like a Reese's Peanut Butter Cup is the perfect combination of chocolate and peanut butter, this activity is the perfect combination of using a coordinate system and seasonal changes related to the Sun's arc path.

YOUR TASKS:

____ 1. The randomizer will put you into groups of three. Each person in the group is responsible for plotting one full path. Each group will also begin by plotting a different path. LISTEN TO ME WHEN I EXPLAIN THIS PART AFTER GROUPS HAVE BEEN DECIDED.

____ 2. If not already done so, mark north, south, west and east onto your celestial sphere model using the azimuth circle provided.

____ 3. With the assistance of your partner/group members, use the external protractor to plot the altitudes and azimuths for each path onto your celestial sphere. Connect the dots for each path with the best fit arc.

Path 1 – blue path

Time of Day	Altitude of Sun (degrees)	Azimuth of Sun (degrees)
7:17am	0	121
9:00am	14	139
11:00am	23	166
12:00pm	25	180
1:00pm	23	196
3:00pm	12	223
4:29pm	0	239

Path 2 – green path

Time of Day	Altitude of Sun (degrees)	Azimuth of Sun (degrees)
5:58am	0	90
9:00am	32	122
11:00am	46	156
12:00pm	48	180
1:00pm	46	202
3:00pm	32	237
6:02pm	0	270

Path 3 – red path

Time of Day	Altitude of Sun (degrees)	Azimuth of Sun (degrees)
5:25am	0	57
9:00am	38	90
11:00am	60	116
12:00pm	69	142
1:00pm	73	180
3:00pm	59	245
8:28pm	0	302

KEY QUESTIONS

ANSWER IN COMPLETE SENTENCES …

(-2 for each question not answered in complete sentences)

1. Using the data provided, and the arc paths you drew, describe each Sun's path in terms of direction of sunrise, direction of sunset, and the altitude of the Sun at solar noon.

   Path1:

   Path 2:

   Path 3:

2. Just by looking at the Sun's paths that were plotted, which path indicates the day that we would have the most daylight hours? Explain your choice.

3. Remember, each path represents the Sun's arc path on a different day of the year.
   How many daylight hours would a person experience on each day?
   There are 2 ways to accomplish this:
   (1) Remember that a full arc represents how long the Sun is out during one day. You can measure the total arc path of the Sun and then divide that total by 15^{o}/hr to get an approximation …
   (2) Do the math to figure exactly how many hours and minutes exist between sunrise and sunset.

   Path 1:

   Path 2:

   Path 3:

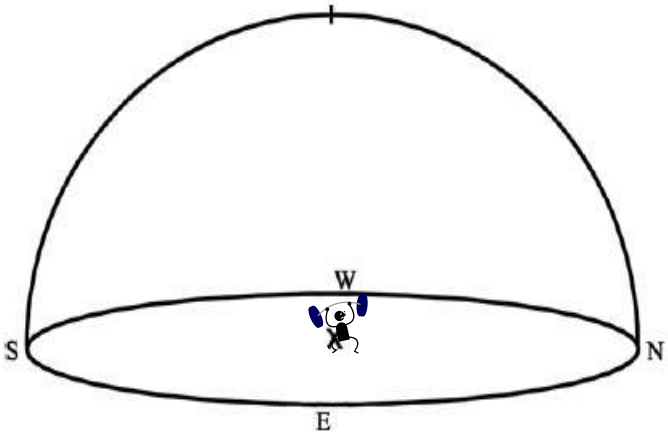
4. Considering the “special dates” that we talked about, which date represents each path?

5. How will the altitude of the noon Sun change in New York from December 22, 2014 to June 21, 2015?

6. How will the altitude of the noon Sun change in New York from June 22, 2015 to December 21, 2015?

7. On which path would the noon Sun cause objects on Earth to have the shortest shadows. Explain your answer.

8. a. Sketch path 1 on the diagram to the right.
   b. Label the date that the path represents.
   c. Plot the Sun as it would appear at 3:00pm on the path.



9. According to your diagram, if it is 3:00pm on the date of path 1, what direction would an observer look to see a shadow? Sketch the shadow as cast by the observer in the diagram.

10. Sketch the position of Polaris on the diagram as it would be viewed in the sky from Syosset, NY.