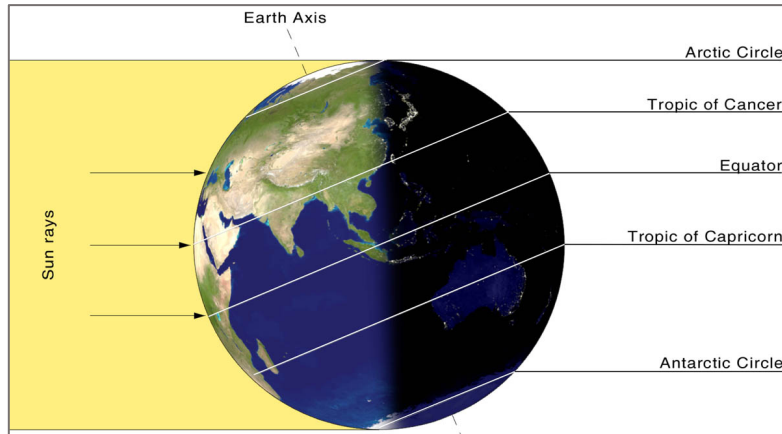


Summer Solstice - June 20th in the Northern hemisphere



Because the Earth wobbles on its axis during the year, in the Northern hemisphere there is a moment when the tilt of the earth finishes leaning $23^{\circ} 27'$ towards the sun and begins to wobble the other way towards $23^{\circ} 27'$ away from the sun. This day is called the summer solstice in the Northern hemisphere and the winter solstice in the Southern hemisphere of Earth. On June 20th if you were on the Tropic of Cancer (latitude $23^{\circ} 27'$) you would see the sun directly overhead at noon.

1. Do some research and find some events that occur on this day around the world and over the ages?

2. Describe what the day might be like if you were in one of these latitudes
 - a. At the Tropic of Cancer? (latitude $23^{\circ} 27' N$)

 - b. North of the Arctic Circle? (latitude $66^{\circ} 34' 44'' N$)?

 - c. At the Tropic of Capricorn? (latitude $23^{\circ} 27' S$)

 - d. South of the Antarctic Circle? (latitude $66^{\circ} 34' 44'' S$)?

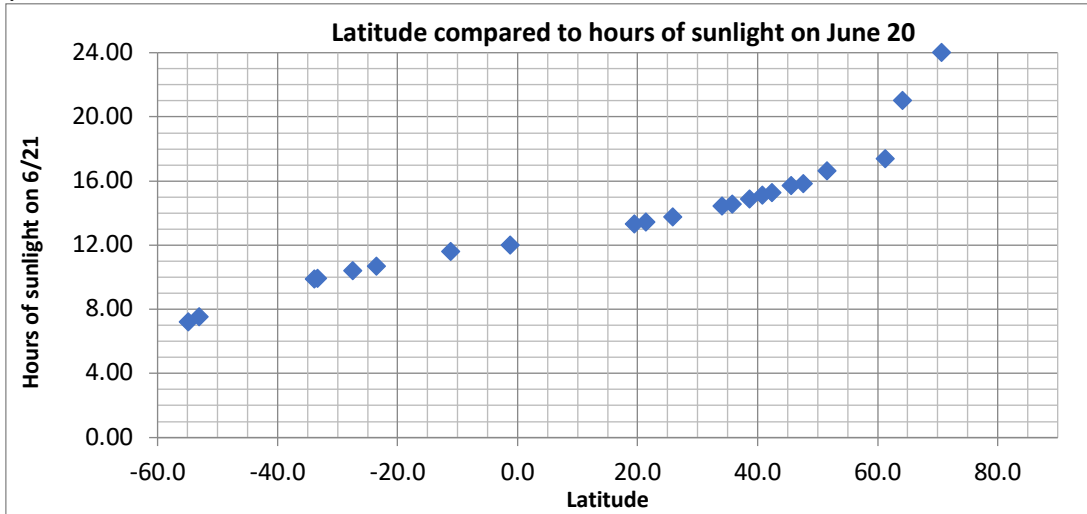
I wondered how the amount of daylight hours would vary at different places on Earth so I made this chart.

3. I didn't finish filling out my chart. Please complete the missing data.

Place	Latitude	Sunrise on 6/20/2012	Sunset on 6/20/2012	Hours of daylight
Anchorage, Alaska	61.218061°	4:20 a.m.	11:42 p.m.	17:22
Seattle, Washington	47.606210°	5:11 a.m.	9:10 p.m.	15:49
Portland, Oregon	45.523452°	5:21 a.m.	9:03 p.m.	15:42
New York City, New York	40.714353°	5:24 a.m.	8:30 p.m.	
Sacramento, California	38.566667°	5:42 a.m.	8:33 p.m.	14:51
Los Angeles, California	34.05°	5:41 a.m.		14:26
Miami, Florida	25.783334°	6:30 a.m.	8:14 p.m.	13:44
Honolulu, Hawaii	21.3°		7:16 p.m.	13:26
Reykjavik, Iceland	64.133334°	2:58 a.m.	Midnight	21:02
London, United Kingdom	51.5°	4:42 a.m.	9:20 p.m.	
Tokyo, Japan	35.683334°	4:25 a.m.	6:59 p.m.	14:34

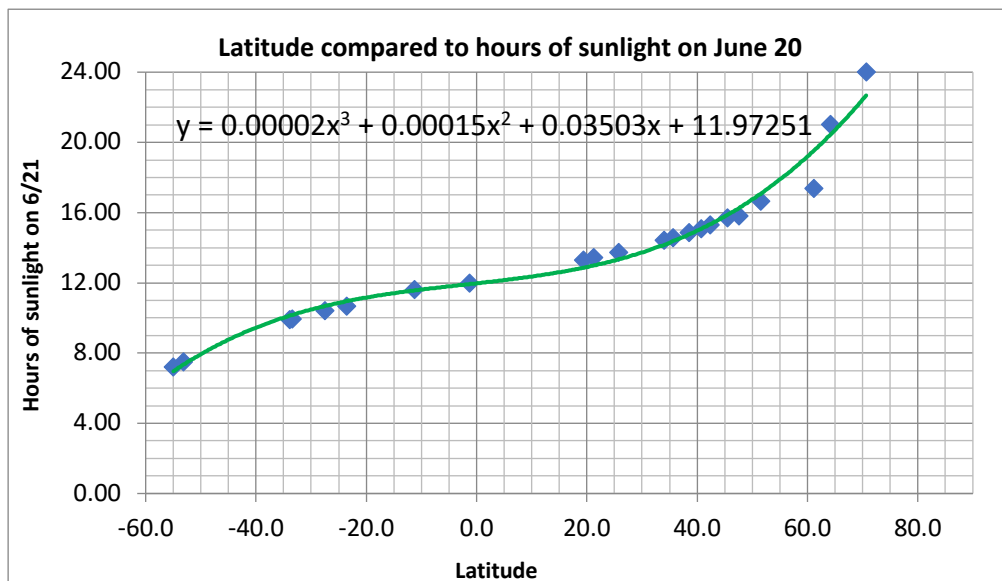
Mexico City, Mexico	19.416667°	6:58 a.m.		13:18
Nairobi, Kenya	1.2833334°	6:33 a.m.	6:33 p.m.	12:00
Newton, Massachusetts	42.33334°		7:40 p.m.	15:17

I entered all of my data on an Excel spreadsheet. I entered my data for latitude and hours of sunlight and got this graph.



I had a problem with charting Nairobi, Kenya because Nairobi is south of the equator. So, instead of trying to graph 1.283 S, I used -1.283.

Excel is so cool. When I selected my data points I was allowed to choose from several trend line types that might fit my graph. I tried linear, exponential, logarithmic, and polynomial. This curve looked like the closest to correlating with my data. It was called a 3rd degree polynomial trend line.



4. Choose a city that is north of the equator. Using the World Atlas link below, find its latitude and then use my chart to estimate the number of daylight hours that city will have on June 21st. Be prepared to share your city and its latitude with your class.

http://www.worldatlas.com/aatlas/latitude_and_longitude_finder.htm

5. Use my trend curve equation to see how many hours of sunlight will correspond to the latitude of the city that you chose.

6. At the time-and-date link listed below, look up your city and find its sunrise and sunset times on June 21st. Were your approximations from the graph and from our trend curve formula correct?
<http://www.timeanddate.com/worldclock/sunrise.html>
7. When choosing my cities, I used almost all Northern hemisphere cities. Explain what you think might happen to the number of daylight hours on June 20th if you chose cities that have southern latitudes.
8. How do you envision the shape of the graph that contains many cities in the southern hemisphere?
9. Do you think my trend line formula would work for Southern Hemisphere cities as well?

Sources: <http://geography.about.com/od/physicalgeography/a/longestday.htm>
http://www.geog.ucsb.edu/~joel/g110_w08/lecture_notes/sun_angle/sun_angle.html
http://www.worldatlas.com/aatlas/latitude_and_longitude_finder.htm
<http://www.timeanddate.com/worldclock/sunrise.html>

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