

Teacher Lesson Guide - Length of Day and Latitude

Use [Google Earth](https://www.google.com/earth/) to determine the relationship between latitude, the time of year, and the length of daylight.

Background:

If the Earth orbited the Sun with an axis perpendicular to its path, the subsolar point would always fall along the equator and the length of the day would not change as the Earth revolves. But since the Earth's axis is tilted $23\frac{1}{2}^{\circ}$, the subsolar point can be anywhere from the Tropic of Cancer ($23\frac{1}{2}^{\circ}\text{N}$) to the Tropic of Capricorn ($23\frac{1}{2}^{\circ}\text{S}$). The number of daylight hours a person experiences depends on where the Earth is in its revolution (the time of year), and how far above or below the equator they are. The hemisphere that has the subsolar point will have longer days and shorter nights.

In this activity, students will find and record the number of daylight hours for cities on different latitudes. After plotting a graph, students will analyze their data to draw logical conclusions about .

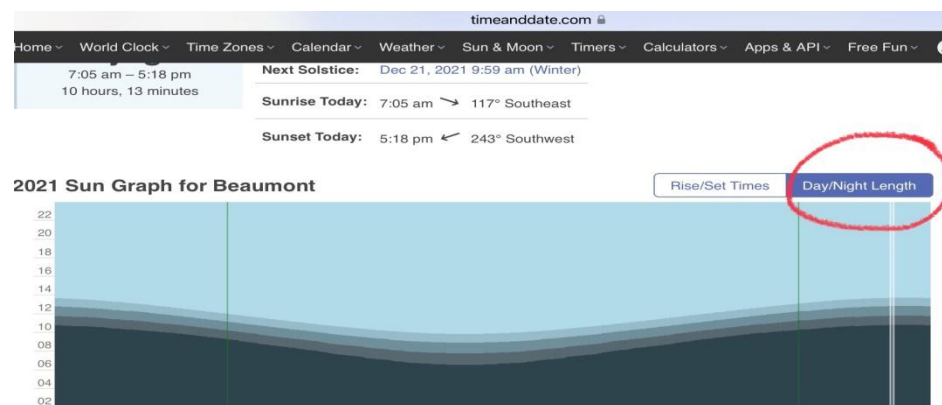
Students will use Google Earth to find their cities. I ask them to use a longitudinal path of about 30° so they don't have to rotate the Earth, but that is not necessary. Latitude is important, not longitude.

Students go to <https://www.timeanddate.com/sun/> to find the number of daylight hours.

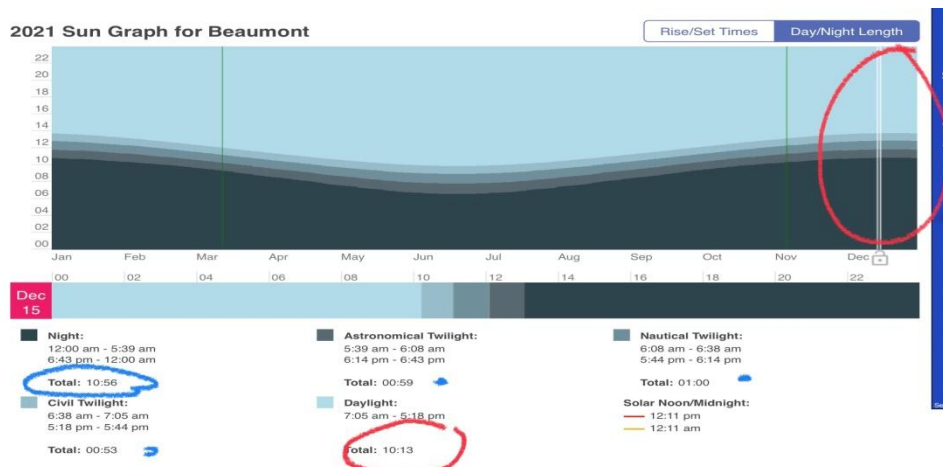
Type the city name in the search box:

The screenshot shows the 'Sunrise and Sunset Calculator — City Lookup' page. At the top, there is a navigation bar with links like 'Sun Calculator', 'Moon Calculator', etc. Below this is a search box with the text 'Search for a city's Sunrise and Sunset:'. The search box contains the text 'Beaumont'. Below the search box, there is a list of search results: 'Beaumont Texas - USA', 'Beaumont (area) Ontario - Canada', and 'Beaumont (area) Manitoba - Canada'. The first result, 'Beaumont Texas - USA', is circled in red. Below the search box, there is a keyboard layout with letters 'q', 'w', 'e', 'r', 't', 'y', 'u', 'i', 'o', 'p' and numbers '1' through '0'.

Hit enter, then choose Day/Night Length



Use the slider to find the correct dates, then find and record the data.



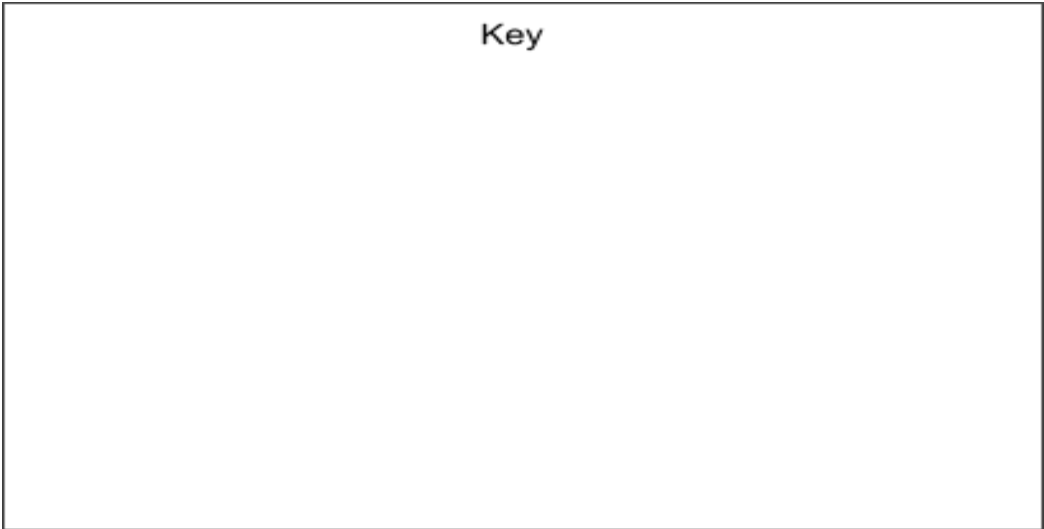
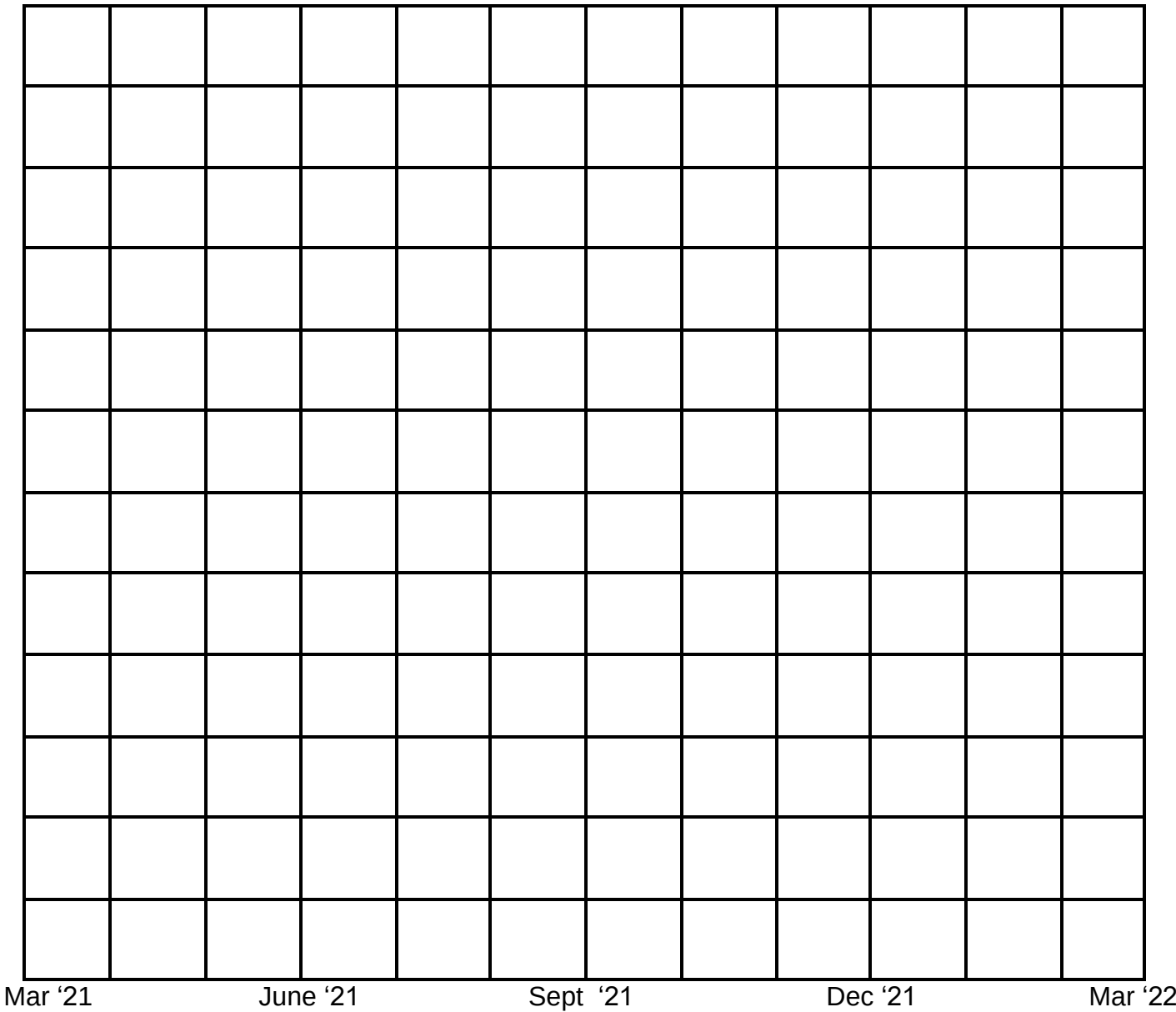
The number of daylight hours and night hours do not add up to 24. Allow the students to determine why. They can look up the meanings of all the twilights.

March equinox – 22nd June solstice – 20th Sept. equinox – 22nd or 23rd
Dec. solstice – 21st – 22nd

Hours of Daylight

City	Latitude	Hours of Daylight March Equinox	Hours of Daylight June Solstice	Hours of Daylight Sept. Equinox	Hours of Daylight Dec. Solstice
Students/groups pick	Must include N or S				

Graph



Conclusions:

Which of your locations showed the least difference in the number of daylight hours? Answer with the city name and the latitude.

This should be the locations closest to the equator.

Which of your locations showed the most differences in daylight hours? Answer with the city name and the latitude.

This should be the locations farthest from the equator.

What do you think accounts for the differences? Create a diagram to include in your explanation.

There are several ways to answer this, but the Earth's tilt should be mentioned. Encourage them to compare the measurement of the Earth's tilt to the measurement of the lines of tropics (both are $23\frac{1}{2}^{\circ}$). Students should also include both rotation and revolution.

How do the northern and southern hemispheres differ in their lengths of daylight?

When the northern hemisphere has more hours of daylight, the southern has less and vice versa.

Pick some new locations and predict the number of daylight hours on different days. Use timeanddate.com to check your predictions.

Multiple correct answers

You know how many hours of daylight each location has, how would you figure out the number of hours of night?

Students must include the twilight hours or the day and night will not add up to 24.

More fun stuff - <https://www.timeanddate.com/worldclock/sunearth.html>