

STELLARIUM ACTIVITY #2: GOING NORTH AND SOUTH

Overview

Latitude is how many degrees your location is north or south of the Earth's equator.
Declination is how many degrees north or south of the *celestial* equator the star is.
Altitude is how many degrees above the *horizon* the star is.

Sky Gem #2 says that

The altitude of the celestial pole equals your latitude.

Software

The project uses **Stellarium** version **0.16.0**. See the "Stellarium Instructions" handout for using Stellarium.

Configuration

Adjust the settings as shown in the instructions handout. Make sure you are using the **Ocean** "landscape" and that your location is **Torrance**.

Zoom in or out until your FOV (field of view) is about 90° — it's displayed at the bottom of the screen. To zoom, use the page-up and page-down keys. (On some computers, hold down the fn key.) Hold down the shift key for slower zooming.

Set the date to **March 1**. Set the time to **16:00:00**. (That's 4 p.m.)

Press the left arrow or the right arrow key until you are facing north. Press the up arrow or the down arrow until the **N** on the north horizon is near the bottom of the screen.

Going North & South

Press the Z key to turn on the azimuthal grid. The green lines are 10° apart if your FOV is near 90°. Estimate the altitude of Polaris at each location. If you can't see Polaris, try hitting the **G** key to make the ground disappear. If Polaris is below the horizon, its altitude is negative. Record in the table on the next page.

Look for the star **Deneb** to the left of Polaris. Deneb is the brightest star in the constellation **Cygnus**.

Now make time go forward until Deneb sets. (Hold down the shift key for more accurate time control.) Record the setting time in the table (just the hours and minutes; ignore the seconds). Advance time until Deneb rises. It will rise shortly after **Vega**. Be sure to get the star exactly on the horizon.

Repeat for:

Anchorage, Alaska (61° N, 149° W)
Guadalajara, Mexico (20° N, 103° W)
Quito, Ecuador (0° N, 78° W)
Santiago, Chile (33° S, 70° W)

(Go to the **Location Window** [F6] to change the location.) In Santiago, you will see Deneb rise first and set later.

Complete the table. Remember that latitude can never be greater than 90°. Neither can the altitude of a star.

	Santiago	Quito	Guadalajara	Torrance	Anchorage
Latitude					
Altitude of Polaris					
Set time					
Rise time					
Time above horizon					

The **Time above horizon** is the **Set time** minus the **Rise time**. Be careful in subtracting, as explained below. If the star never sets, put "circumpolar."

Calculate the hours and minutes each star spends above the horizon by subtracting the rise time from the set time. Be careful: think what you are doing. If the set time is before the rise time, add 24 hours to the set time. If you have to borrow an hour when subtracting, remember that you are borrowing 60, not 10, because there are 60 minutes in an hour.

$$\begin{array}{r} \text{Example: } 17^6:28^5 \\ - 7^4:4^5 \\ \hline 9^4:0 \end{array}$$

Answer the following questions.

Q 1. *Write a paragraph describing what happens to the North Celestial Pole as you go from Santiago to Anchorage.*

Q 2. *How long does a star spend above the horizon, if you are on the equator?*

- Q 3. *Write a paragraph explaining how the amount of time a northern hemisphere star spends above the horizon changes as you go north.*
- Q 4. *What happens to the amount of time a **southern hemisphere** star spends above the horizon as you go north?*
- Q 5. *Explain how a sailor at sea could determine his latitude by watching the stars at night.*