

Earth's Tilt Graphing Activity

Standards:

- 5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Purpose:

To explore the relationship between the tilt of the Earth and seasons.

Background:

We know the Earth makes two movements. It revolves around the sun and it rotates on its axis. However, that axis is not straight up and down in relation to the movement around the sun. It revolves around the sun rotating on a tilted axis. Specifically, it is tilted to 23.5° .

Directions:

1. Open SEPUP Seasons Interactive:
https://sepuplhs.org/middle/iaes/students/simulations/sepup_seasons5.html
2. This interactive shows you the relationship between the sun and the Earth at different times during the year. It also shows the effect on day length and temperature at different places on Earth. The default of the model is to show Earth at its 23.5° tilt. You can also change the tilt to 0° .
3. In the northern hemisphere, summer is generally June-September and winter is generally December-March. Fill out the data table with the distances from the sun during each month.

	March	June	September	December
Distance (km)				

4. When is the Earth closest to the sun?
5. What season is it in the northern hemisphere then?
6. When is the Earth farthest from the sun?
7. What season is it in the northern hemisphere then?
8. Based on what you learned, does distance from the sun cause the seasons? Why or why not?

9. Turn on the line for Anchorage under “Show City” (and all the cities if you want). Switch back and forth between the two tilts to observe how it affects day length. What do you observe?

10. Set the tilt to 23.5° . In the table below, record the temperature in Anchorage, AK in $^\circ\text{F}$, during each month of the year. Repeat with the tilt set to 0° .

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Anchorage, AK at 23.5°												
Anchorage, AK at 0°												

11. Graph your results on the following page.
- You want your data to take up as much space as you can on the paper (you can see patterns better than on a teeny tiny graph). Figure out about how many lines you have for your axis and then your biggest data point. Then figure out how many each line should be worth to still fit.
 - Since you will have two lines on your graph, one for each city, it is often easier to graph all the data points for one line and connect them, before graphing any data points for the other. You can also make the lines in different colors.
 - Don't forget all your titles, labels and units.

12. How is seeing a graph of the data beneficial over just the table?

13. Based on what you have observed, what does the tilt of the Earth have to do with the seasons? Explain.



