



# We're Burnin' Daylight



## Overview

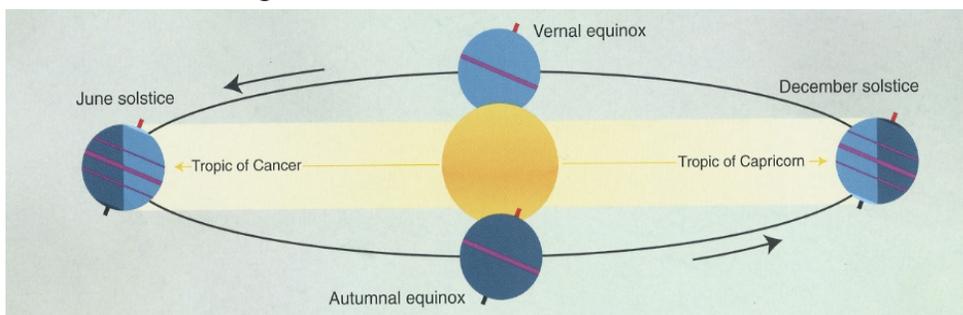
How does the number of daylight hours we experience change during the year? After determining the percent of daylight hours in a given day according to the data on the *Minnesota Weatherguide Environment™ Calendar* students will graph the percentages on a Length of Day Chart and notice a pattern of lengthening or shortening daylight hours consistent with seasonal change.

## Standards/Benchmarks \*

Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data. Math (4.4.1.1)

## Background

The following diagram demonstrates the relationship between the Earth's tilted ( $23.5^\circ$ ) axis and the sun, so that the sun is higher in the sky for a longer period in the northern hemisphere's summer solstice (June) and lower in the winter solstice (December). During the spring and fall equinox the length of day and night are equal. This is part of the 3rd grade science standards, so students should be familiar with the concepts. You may also refer to the second grade lesson "Sunrise-Sunset"



## The Activity

### Day 1

#### Calculating Percent

1. Ask students, "Is it easier to go to bed in the summer or winter? Why?" This should spark a discussion on the changing amount of daylight hours as it correlates to seasonal change. This discussion will continue at the conclusion of the lesson.

2. Gather students in a circle on the floor and show them the *Minnesota Weatherguide Environment™ Calendar*, pointing out the inclusion of the daily Sunrise and Sunset times. Some students may notice already that it changes by a small amount each day.

## Time:

Day 1: 60 minutes

Day 2: 60 minutes

## Skills:

Recording  
Predicting  
Critical thinking  
Data collecting  
Drawing  
Interpreting

## Vocabulary:

percent  
numerator  
denominator  
daylight

## Materials Needed:

- *Minnesota Weatherguide Environment™ Calendar*
- Whiteboard
- Calculators
- Math notebooks
- Pencils
- Graph paper

3. Tell students that you will be working in partners to find the percent of daylight hours for a designated month and then graphing the results.
4. Ask students how many hours there are in a day (24). Tell them that this number is our denominator because we are finding out how many hours are daylight out of a possible 24 hours.
5. Ask students how we can find out how many hours are daylight for a given day (count hours from sunrise to sunset). Tell them that this is the numerator: the number of actual daylight hours.
6. Explain that to calculate percent you take the numerator divided by the denominator to get a decimal. Then multiply the decimal by 100 to get the percent. You may choose to round to the nearest percent, tenth of a percent, or hundredth of a percent.
7. Pair students up to share the calculations for one month (12 months, 2 students per month, approximately 15 days per student). This work should be done in students' math notebook. Partners will share calculated percents to have data for a whole month.

## Day 2

### Graphing the Percents

1. Project a sample, blank piece of graph paper. Show students how to create axis, and labels appropriate for the size graph paper you are using (the X axis should be "Date" and the Y axis should be "Percent of the Day that is Daylight"). Demonstrate how to plot their percents on the graph, and color the bars.
2. Hand out the graph paper one piece per pair of students. Students work with their partners from Day 1 to create a graph the data from their month.
3. Allow time for graphing. Circulate and assist as necessary.
4. When students are done graphing bring them together in a circle along with their graphs. Collect graphs and display them in a central location in phenological (seasonal) order; start with June. These will be helpful to refer to throughout the discussion. Ask students if they see any patterns in the graphs when displayed this way.

### Questions for Discussion

- Which month has the greatest percentage of daylight hours? June, it is the month of Summer Solstice when the Earth's axis is pointing towards the sun.
- Which month has the least percentage of daylight hours? December, it is the month of Winter Solstice when the Earth's axis is pointing away from the sun.
- Are there any months that are very similar in the percentages of day length?  
March and September have similar percentages because this is the time of spring (Vernal) equinox and fall (Autumnal) equinox.
- Are there any places in the world that experience 100% daylight during certain times of the year? Why? Regions in the far north, or the far south, experience times of the year where it is light 100% of the time. Similarly, at other times of the year it is dark 100% of the time. This is due to the tilt of the earth on its axis and it's rotation around the sun. NOTE: This discussion could lead to a more in depth discussion on the tilt and rotation of the earth.
- Are there any regions of the world that always experience the same amount of daylight? Regions along the equator experience the same amount of daylight hours all the time.

### Extensions

- Have a thirteenth group graph data for the month of June from the previous year so that the "full circle" of the year of daylight can be seen more clearly.
- Give students a globe with the Earth's tilt built into it, and a light. Challenge them to figure out why daylight changes.

## Resources

For a diagram that demonstrates that the Earth is actually closer to the sun in winter see this site:

<https://www.uwgb.edu/dutchs/AstronNotes/HowSolSysWorks.HTM>

If students need an activity to review the reason for the seasons, here's one from National Geographic:

[http://education.nationalgeographic.com/education/activity/the-reason-for-the-seasons/?ar\\_a=1](http://education.nationalgeographic.com/education/activity/the-reason-for-the-seasons/?ar_a=1)

## \* Minnesota State Academic Standards

### Standards Met

Subject	Code	Standard	Benchmark
Math	4.4.1.1.	Collect, organize, display and interpret data, including data collected over a period of time and data represented by fractions and decimals.	Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.