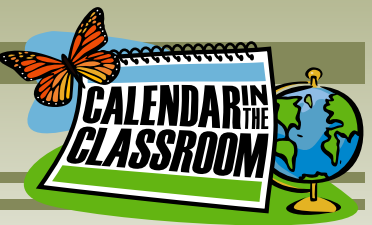




# Awesome Autumn



## Overview

Students will collect leaves, sort them by color and create a color graph. The *Minnesota Weatherguide Environment™ Calendar* serves as a resource for fall leaf color and other phenological events.

## Background

Phenology is the branch of science dealing with the relationship between climate and periodic seasonal occurrences in nature, such as the blooming of flowers, changing leaf color, bird migration, ice-out on lakes.

Fall leaf color is a delightful and easily observed phenological event - the process of the plants responding to changes in day length, temperature and water availability their conditions are all related to the end of the growing season.

Although the students may be excited by the bright colors, the processes of sampling and graphing are the real focus of this lesson. We collect our samples. We observe. We record our observations. We analyze our findings, and we graph our conclusions. Graphs tell a story! They are a way to use numbers to make a picture of observations.

Sampling is the process of selecting a small quantity of something to represent the total. Scientists usually use a random sample, but in this case the children are given some freedom to choose their own leaf sample.

As you direct students to collect leaf samples remind them to respect living things. Choose only 10 fallen leaves. At the end of the lesson these leaves can be returned to the collection site to emphasize recycling in nature.

The children may notice that some trees are shedding leaves while other trees will remain green all winter. Coniferous trees (evergreens) have needles instead of leaves and their color may darken in winter. Deciduous trees shed their leaves on a seasonal schedule. The intensity of color in the leaves is determined by the species of trees and by the environmental conditions. Cool nights and sunny days usually yield the most beautiful colors.

## The Activity

### Warm-up

Read aloud a picture book about autumn and/or leaves.

1. Begin discussion by asking students if they have noticed any changes in the trees since school started? What changes do they notice?
2. Show students a fall photo from the *Minnesota Weatherguide Environment™ Calendar* or other resource. Discuss everything they notice. (Picture should include trees showing leaves of various colors.) What colors of leaves do they notice?
3. Read the phenology facts for the current month in the calendar. (Recommendation: Share just the facts related to foliage, leaf colors and weather conditions.)

### Time:

60 min. In the fall

### Skills:

Observing  
Sorting  
Interpreting  
Drawing conclusions

### Vocabulary:

Graph  
Phenology  
Observation  
Senses  
Sampling  
Deciduous  
Coniferous (Evergreen)

### Materials Needed:

- *Minnesota Weatherguide Environment™ Calendar*
- Leaves collected by students
- Graph paper
- Crayons
- A variety of picture books about leaves (see resource list)

4. Explain that students will be studying math and science today in the outdoor classroom. Establish expectations for outdoor classroom behavior. (We don't run and shout in our indoor classroom – or our outdoor classroom.)
5. Take students for a hike where they will be able to collect leaves. Explain that they will work in teams of two and may pick up leaves anywhere along the hike, but they need to have 10 leaves of various colors by the end of the hike.
6. Return to the classroom with leaves and have students sort their individual leaves by color. (Use an outdoor space if weather conditions allow. Leaf graphs can be constructed on grass or on sidewalks. Students can use clipboards/paper or notebooks on the ground or at desks/tables in an outdoor classroom.)
7. Explain to the students that they will be making a graph showing the colors of the leaves that they have collected. Remind the students that the graph made by each team may be different and will show the variety of colors collected. Students may not have every color.
8. Hand out autumn leaves graph. Circulate around the classroom to help students complete their graphs.
9. Depending on your grade level, also have students prepare data in fractions and convert to decimals. You may also form larger groups and have students: group leaves of specific colors/types into 10's using ten-frames, skip count by 2's and 5's, and more.

### Wrap Up & Assessment

Have children read and compare their graphs in small groups or display on the board for all to see. Students should have graphs properly labeled and should be able to explain the information conveyed in the graph.

### Questions for Discussion

- Why do our graphs differ from each other?
- What color in your group appears most often? Least often? Why do you think that is so?
- If we made a whole class graph, what color would appear most often?

### Extensions

#### Science/Math

- Sort the leaves by different types.
- Identify what trees the leaves came from.
- Encourage other types of graphing to organize information.

#### Language Arts

- Have a basket of books about fall leaves for the students to explore. Share/read a nonfiction book.
- Review the phenology facts contained in the calendar. Did any of them match with what the students found? If not, discuss why?

### Resources

Ehlert, L. *Red Leaf, Yellow Leaf*

Robbins, K. *Autumn Leaves*

Gerber, C. *Leaf Jumpers*

Minnesota Weatherguide Environment™ Calendar

online: <https://jeffersfoundation.org/programs/calendar-in-the-classroom/>

## Minnesota Academic Standards

### 3-D Science Standards

#### Science Practices:

2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
8. Obtaining, Evaluating and Communicating Information

#### Crosscutting Concepts:

1. Patterns
3. Scale, Proportion, and Quantity

#### Disciplinary Core Ideas:

LS1: From molecules to organisms: Structures and processes

1st Grade: Provide evidence to represent how plants use their external parts to help them survive, grow, and meet their needs.

3rd Grade: Plants have internal and external structures that impact survival

LS4: Biological evolution: Unity and diversity

K: Make observations of plants to compare the diversity of life in different habitats

PS1: Matter and its interactions

K: Sort objects in terms of color, size, texture, & communicate reasoning for sorting system

### Math Standards

Grade	Strand	Anchor Standard	Code	Benchmark
K	Data Analysis	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.	0.1.1.2	Organize objects, draw picture, or use tally marks to represent data and communicate observations. (MP3, MP6)
	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	0.2.3.1	Compare objects with a measurable attribute in common, to see which object has “more of”, “less of” or the “same as” the attribute and explain the reasoning. (MP3, MP5)
			0.2.4.1	Sort objects using characteristics such as shape, size, color and thickness. (MP1, MP3)
	Patterns and Relationships	Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	0.3.5.2	Count collections of objects up to 31 by grouping in 10s using ten-frames, cups or other tools. (MP6, MP7)

1	Data Analysis  Patterns and Relationships	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.  Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	1.1.1.2  1.3.5.1  1.3.5.3	Represent the data as a drawing, tally marks, frequency bar graph. (MP1, MP3)  Count collections of objects up to 120 using groups of 5s or 10s. (MP1, MP5)  Count, with or without objects, forward and backward from any given number up to 120. (MP7)
2	Data Analysis  Patterns and Relationships	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.  Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	2.1.1.3  2.3.7.2	Collect and use data to consider and decide what data will answer a question. Represent the data as drawings, picture graphs...Communicate observations. (MP3, MP5)  Recognize patterns in counting. Skip counting by 2s and 5s from any given number up to 120. (MP7)
3	Data Analysis  Patterns and Relationships	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.  Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	3.1.1.5  3.3.5.11	Critically analyze data visualizations, including frequency tables, bar graphs, picture graphs...to support a claim and solve situations. (MP1, MP3)  Generate equivalent forms of one-half and 1 using fractions with denominators of 2, 4 and 8 and justify why these forms are equivalent using a visual model. (MP2, MP3)
4	Data Analysis  Patterns and Relationships	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.  Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	4.1.1.4  4.3.5.14	Critically analyze data visualizations, including tables, double bar graphs...to support a claim and solve contextual situations. (MP3, MP7)  Recognize the relationship between decimals and fractions. Read and write decimals and fractions in both decimal and fraction notations using words, symbols and expanded form. Recall the fraction and decimal equivalent