
Four Seasons of Math Teaching & Learning

Autumn Math Walk



adapted from the book by
Deanna Pecaski McLennan

Introduction

Spending time immersed in nature is a wonderful way for young children to learn about our world.

There is beauty in mathematics. Helping children to recognize the strong connection between nature and math may encourage them to see mathematics as an aesthetic and captivating subject. So often the only experiences children have with math are those found inside the classroom. Exploring the authentic math that exists in nature may help nurture children's interest and confidence, building a strong foundation for subsequent experiences.

My hope in writing this book is to inspire children, educators and families to see math as an inviting discipline that lives beyond the walls of the classroom. Our natural world is filled with amazing mathematical connections. This book does not need to be read beginning to end. The photos can be used individually, or in combination, to spark mathematical conversations and connections with children. Ask children what they see, think and wonder about each picture. Ask what their theories are for what they see happening on each page. At the end of the book you will find information to compliment each photo. Adults can support and extend children's mathematical and scientific ideas using this information. Additional resources can scaffold and build inquiries that spark from the text.

The information presented in this book can serve as an introduction to new math concepts, or as a reference when natural treasures are discovered by children outdoors. Consider reading it together with children before venturing out into the world on your own math walk. You might choose to use the photos as conversation starters, or read the book in its entirety using photos and narrative.

When we look at the world through a mathematical lens, we discover that anything is possible!

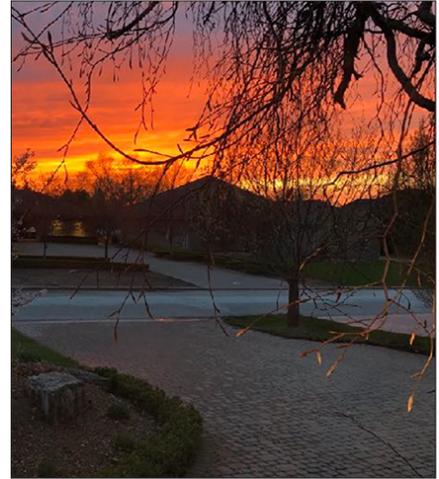
~Deanna

Autumn Math Walk — A Teacher's Guide

The Sky

Draw children's attention to the different shades of the sky, the contrast of light and dark objects, and the concept of time. Ask children to consider why the times of sunrise and sunset continually change over the course of a year.

In autumn the days grow shorter and the sun rises later each day. The amount of daily sunlight we receive decreases as the earth's axis tilts away from the sun. This can be measured by a few seconds, or minutes, depending on where you live. On the autumn equinox the amount of day and night we experience is almost equal. Math ideas might include measurement, time, classification, angles, positive and negative space.



The Earth

Draw children's attention to the different imprints they notice in the dirt, and the scattered piles near the individual prints. Ask children to share their experiences finding and researching the prints they have found outdoors.

Footprints in soil can give clues about what type of animal has travelled through. Details such as the size and shape of the print, the number of visible toes, and the length of the animal's claws all help with identification. Prints in soil are frieze patterns. Frieze patterns are designs on a flat surface that move in one direction and are repetitive in nature. Measuring the distance between each track gives clues to the animal's gait (e.g., fast/slow, left side/right side). Math ideas might include shape, size, speed, opposites, reflection and symmetry.

EEK — A Spider!

On your walk, you may see a spider, maybe even a Daddy Long Legs. Draw children's attention to the proportion of the arachnid's legs to its body. Ask children to consider why the creature's legs are so long. They might wonder about its actual size in comparison to the child's hands.

There is a misconception that Daddy Long Legs are spiders, but they are actually arachnids. They are similar to spiders in some ways, including having eight legs. If a predator catches them by a leg, they have the option to shed the leg although it might not grow back. Math ideas might include size, shape, number, proportional reasoning, classification and subtraction.

The Plants

Ferns

Draw children's attention to the repeating nature of the fern fronds. Ferns are symmetrical, with one half of the frond closely resembling the other half. Ask children to consider what an individual frond looks like when magnified. Ferns are self-similar objects, which means that one frond looks like a miniature version of the fern as a whole. Pine trees are also an example of a self-similar object.

The small tightly curled end of a frond is called a fiddlehead. As these are exposed to light, they will unroll and grow. The spiral form of the fiddlehead follows a numerical pattern called the Fibonacci Sequence. Math ideas might include shape, size, length, symmetry, counting and patterns.

Sunflowers

Draw children's attention to the repeating nature of sunflowers, and ask children to notice and name the shapes, colours and patterns they see. Ask children to pay careful attention to the spiralling design they notice in the seed head, and hypothesize as to why this occurs on all sunflowers.

Like fern fronds, the seeds on a sunflower are arranged in a spiralling pattern that can be represented by numbers called the Fibonacci Sequence. The seeds curve from the centre of the flower to the petals, using a numerical arrangement in order to maximize their placement. Children might also be curious about the large number of seeds that can grow on a large sunflower. Math ideas might include size, shape, pattern, colours, estimation, and symmetry.



Flowers & Gardens

Draw children's attention to the intricate structure of the individual flowers, and ask children to estimate how many flowers and petals there might be in total. Ask children to suggest ways they would solve this estimation and calculation problem in real life. When discussing flowers, highlight the variation in colour, and draw children's attention to the intricate center of each bloom.

Daisies are composite flowers which means the yellow center in the middle, called a disc floret, is actually a cluster of tiny symmetrical flowers. Math ideas might include problem solving, planning, estimation, counting, classification, sorting, colour, symmetry and shape.

Leaves & Trees

Draw children's attention to the different colours visible on the leaves. Ask children to share their ideas for why so many different shades appear on the same tree. Children can also share their theories for why and how leaves change from green to red, brown, orange, purple, and yellow in autumn.

Seasonal change is a periodic cycle. Autumn, winter, spring and summer start and end on approximately the same calendar dates, regardless of the year. One hundred years ago, and one hundred years from now, autumn will still begin and end at approximately the same time. Autumn brings less daylight and colder temperatures, which results in trees producing less food. A chemical reaction occurs in leaves, creating the appearance of many colours. Math ideas might include transformation, colour, number, shape, pattern and measurement.

Pay close attention to the trunk of a tree. Draw children's attention to the number, size and shape of the holes in the bark. Ask children to share their thoughts on how the holes appeared in the tree. Children might also be interested in discussing the colours, textures, and lines they see in the bark itself.

Holes in trees can be caused by many things including wood boring birds and insects. Sometimes holes are the result of human action (e.g., tapping for syrup). Math ideas might include measurement, texture, pattern, line, shape, and colours.

Birds & Bugs

Spotting a Ladybug

Draw children's attention to the unique markings of a ladybug. Ask children to share their experiences with insects, including their theories for why ladybugs have different numbers of spots.

There are over 450 different species of ladybugs in North America alone. The number of spots helps to identify which kind it is. This colourful beetle has mirror symmetry on its wings. This means that both wings are mirror images of each other. Math ideas might include size, shape, colour, number, classification, pattern, measurement and symmetry.

Birds

Draw children's attention to the calls and songs birds make. Point out that birds make unique sounds, and these help birders identify which type they are. This is especially helpful for when a bird can be heard but not seen in their natural habitat. Ask children to share their previous experiences listening to birds outdoors, and to share any distinct ones they might know. Many bird calls and songs can be found on nature websites online.

Bird calls are short and simple. Songs are more complex and have an identifiable pattern. Children might be curious to learn about local birds in their area. Feeders can be hung outdoors and children can observe and record the numbers and types of birds that visit. Math ideas might include classification, pattern, number, volume, cadence, measurement, and data management.

Butterflies

Draw the children's attention to the visible patterns on the butterfly's wings. Spots and stripes on living creatures help identify them as part of a species. Many stripes are one-dimensional patterns that have alternating colours. Although spots might look random, they are often placed uniformly over a specific area of the living creature's body. Ask children to describe the stripes and spots they notice on the butterfly's body. What are their theories for why these exist? What other living objects can they identify that have spots and stripes?

In autumn Monarch butterflies begin their migration south across North America to warmer climates. They fly thousands of miles on this incredible journey. Children might be interested in learning about their lifecycle. Math ideas might include pattern, shape, colour, line, texture, measurement, and cycles.



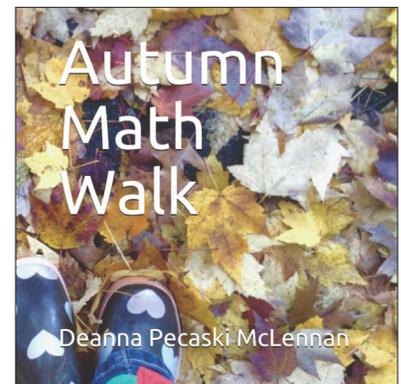
The Weather

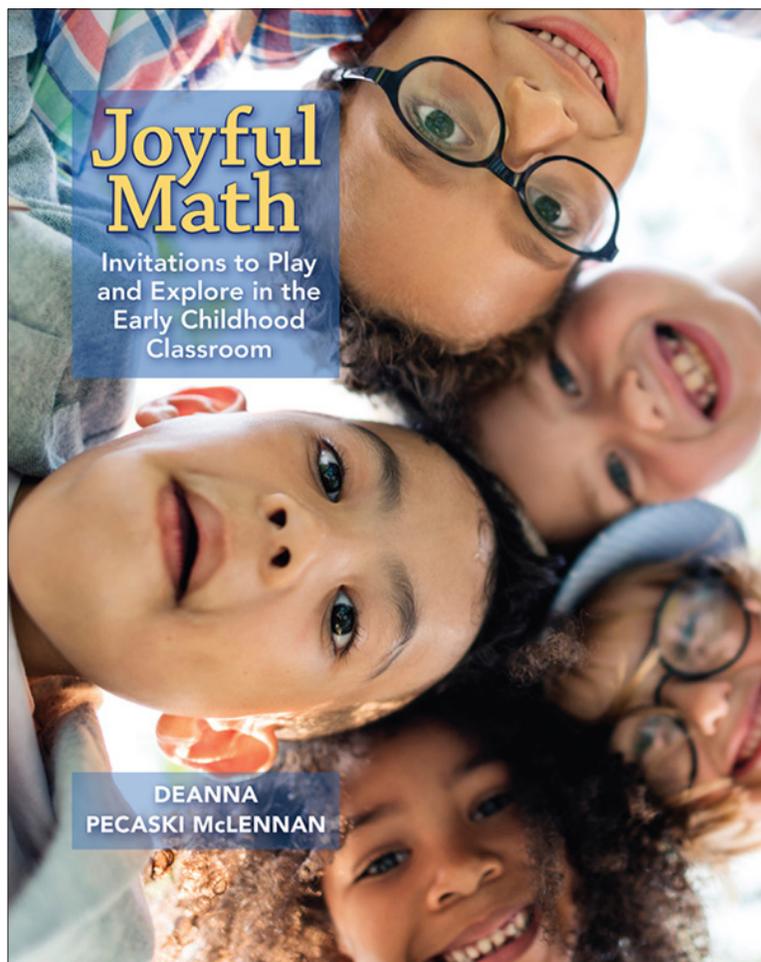
Don't shy away from the weather! On a rainy day take children outdoors to experience it firsthand. Draw children's attention to the circles forming in the puddle as a result of raindrops falling. Ask children to describe what they see, and offer theories on why this is happening.

The force of the raindrop displaces the puddle water on impact. Circular symmetry results because the raindrop moves the fluid water equally away from the point of impact. Waves move outwards in a patterned rhythm, which is why you see many circles inside one another in the photo. Math ideas include shape, size, pattern, force, capacity, and cycles.

The Books

The original picture book, *Autumn Math Walk* by Deanna Pecaski McLennan, is available for purchase from [amazon.ca](https://www.amazon.ca). You'll also find books for Winter, Spring, and Summer.





Joyful Math

Invitations to play and explore in the early childhood classroom

Deanna Pecaski McLennan

160 pp • ISBN 978-1-62531-325-6 • \$39.95 • Pre-K–1 • 2020

Joyful Math is about creating invitations for young children to engage with math ideas through art, literacy, and outdoor play. It focuses on building spaces in early childhood classrooms where children see themselves as mathematical thinkers with valuable ideas from the very start. The book is filled with a range of tools and models, including:

- stories, vignettes, and photos illustrating how to develop a classroom environment that fosters curiosity and wonder for mathematics
- practical tips for inviting students to engage in mathematical play throughout the day
- examples of ways to document children's experiences to make math learning visible to parents and the greater community

Supported by her experiences exploring math with young children, Deanna's methods will inspire educators to be curious about math, take risks, try different approaches, observe carefully, and collaborate with children as co-learners.