



# Fractal Trees

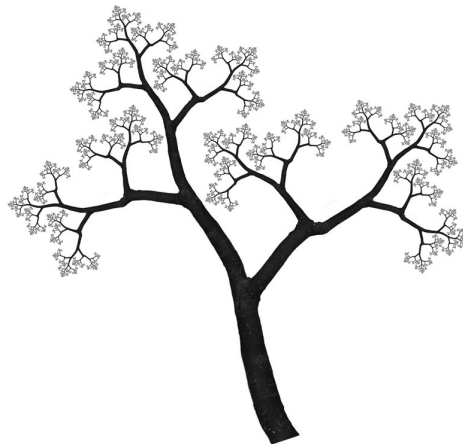


## Overview

In this lesson, we use the natural fractal branching of a tree to explore quotients and ratios in a simple, tangible way. We also use simple tools like rulers and protractors to measure lengths and angles, seeing how mathematical a complicated tree can be. We investigate naturally occurring cracks outside around your school. This activity wraps up with understanding tree growth and ecology and relationship between tree circumference and age.

Like all fractals, a tree grows by repeating the simple process of branching. This means a little piece of a tree has the same general shape as a bigger part, which also is similar to the entire tree. This property of fractals is known as “self-similarity.”

In this activity, we will verify the similarity of branches of a tree to the whole object. To do this, we compare the lengths of connected branches and see that as they get smaller, the ratio of the lengths of branches stays the same.



Appropriate for: grades 3 – 12, college and adult

## Objectives

- To characterize trees according to their fractal properties
- To use appropriate tools strategically
- To measure lengths and angles
- To work with quotients, ratios and circumference of a circle
- To apply mathematical concepts to real-life situations
- To generate and analyze patterns
- To model with mathematics and to classify shapes by properties of their lines and angles
- To attend to precision

## Materials

- Protractor
- Ruler with millimeters
- Calculator
- Fractal Tree worksheet
- Pencil



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## Common Core Standards for Mathematics

<b>Code</b>	<b>Standard</b>	<b>Grade</b>	<b>Code</b>	<b>Standard</b>	<b>Grade</b>
OA	Operations and Algebraic Thinking	4, 5	NS	Number System	6, 7
MD	Measurement and Data	4, 5	RP	Ratios and Proportional Relationships	6, 7
G	Geometry	4, 5, 7	EE	Expressions and Equations	7
NF	Number and Operations – Fractions	4, 5			

HS: Numbers (Q), Modeling, Geometry (SRT, MG)

## Common Core Standards for English Language Arts

<b>Code</b>	<b>Standard</b>	<b>Grades K – 5</b>	<b>Grades 6 – 8</b>	<b>Grades 9 – 12</b>
RL	Reading: Literature	1, 4, 7, 10	1, 4, 7, 10	1, 4, 10
RI	Reading: Informational Text	1, 3, 4, 7, 10	1, 3, 4, 7, 10	1, 3, 4, 10
FS	Foundational Skills	1, 2, 3 for grades K – 1; 3 and 4 for grades 2 – 5	None available	None available
W	Writing	2, 3, 8; 4 for grades 3 – 5	2, 3, 4	2, 3, 4, 9
SL	Speaking and Listening	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6
L	Language	1, 4, 6; 3 for grades 2 – 5	1, 3, 4, 6	1, 3, 4, 6
RST	Science and Technical Subjects	None available	1, 3, 4, 6, 7, 10	2, 3, 4, 6, 7, 10