Name(s)

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Project Number

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Project Title

Big vs. Tall: The Redwood

Abstract

Objectives/Goals
The objective is to determine if there is a ratio that describes the height of a redwood tree compared to its base circumference.

Methods/Materials
I used the equation of tangent, given the length one of the sides and the angle, to find the length of the other side. I built a protractor to use in gauging the angle (x) from the ground to the top of the tree from a distance of 20-200 feet. I measured the distance (A) to the base of the tree with my paces. I then measured the circumference of the base of the tree with a tape measure hand made from twine that could wrap around the trunk. I calculated the height of the tree (O) according to the following formulas: $\tan(x) = O/A$, or $O = A*\tan(x)$.

Results
Several local trees were measured and their data graphed. The graph of tree height versus tree circumference shows a curve resembling the logarithmic relationship. This is represented by the formula $f(x) = \log(b)(x)$, where x is the tree circumference, f(x) is the tree height, and b is the logarithm base.

Conclusions/Discussion
Rather than a ratio, a distinct relationship called the logarithmic relationship was observed between a redwood tree's base circumference and its height. I believe I found this relationship to be true because of the nature of how redwood trees grow in clusters. I presume that these trees grow very tall very fast because they need to compete for sunlight. Also I conclude the redwood trees tend to slow their growing once they have reached a height where they can get enough sunlight to thrive. Meanwhile, the circumference of redwood trees continues to get larger no matter the height because the trees add a ring to their main trunk every year they are alive.

Summary Statement

I discovered a logarithmic relationship between the base circumference and height of redwood trees near my home in Santa Cruz county.

Help Received

I built the materials myself. My parents helped with performing measurements requiring more than two hands, and also helped me explore different mathematical relationships to explain my data.