

TRIGONOMETRY APPLICATIONS

UNIT CIRCLE

CONCEPT In trigonometry, the unit circle is a circle with a radius of one unit, centered at the origin of a coordinate plane. It is commonly used to define the values of the six trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) for any angle in radians or degrees. The unit circle is divided into four quadrants, each containing angles with positive or negative values of sine, cosine, and tangent. The coordinates of any point on the unit circle correspond to the values of sine and cosine for the angle formed by the point and the positive x-axis. The unit circle is a powerful tool for understanding the properties of trigonometric functions and their relationships to one another.

REAL WORLD CONNECTIONS

Nebraska has a significant amount of wind power potential, and wind turbines are often used to generate electricity. The blades of a wind turbine are designed to capture the energy in the wind, which varies depending on the direction and speed of the wind. The Unit Circle is used to represent the relationship between wind direction and speed, and trigonometric functions such as sine and cosine are used to calculate the force and torque on the wind turbine blades. By using trigonometry and the Unit Circle, engineers can design wind turbines that are more efficient and produce more electricity.



BACKGROUND

The use of circles to study trigonometric functions dates back to ancient Greek mathematicians such as Hipparchus and Ptolemy. However, the modern concept of the Unit Circle was first introduced in the 18th century by mathematicians such as Leonhard Euler and Johann Bernoulli.