

## CALCULUS APPLICATIONS PROPORTIONAL RELATIONSHIP

**CONCEPT** A proportional relationship is a type of mathematical relationship between two variables where their ratio remains constant. This means that as one variable increases or decreases, the other variable also changes in a consistent way. Proportional relationships can be represented by linear equations in the form y = kx, where k is the constant of proportionality. In calculus, the concept of proportional relationships is important in understanding the behavior of functions, and can be used to model real-world phenomena such as rates of change and growth. By analyzing the rate of change of a proportional relationship, calculus can provide insights into the behavior of systems over time, and help predict future trends and patterns.

## REAL LIFE CONNECTIONS

**COOKING:** Proportionally adjusting the ingredients in a recipe based on the amount of people being served. **SHOPPING:** The calculation of sales tax or discounts. **MAPS:** Calculating the distance from one location to another and

understanding the scale of a map.



## BACKGROUND

Proportional relationships have been studied for centuries, but their connection to calculus can be traced back to the work of mathematicians such as Isaac Newton and Gottfried Wilhelm Leibniz in the 17th century. These mathematicians developed the concept of calculus, which involves the study of rates of change and slopes of curves. Proportional relationships were a fundamental concept in calculus, as they provided a simple and important example of a function whose derivative (slope) is a constant. In the centuries that followed, the study of proportional relationships continued to play an important role in the development of calculus, leading to the development of new techniques and applications in fields such as physics, engineering, and economics. Today, the study of proportional relationships remains a central part of calculus education and continues to be an important tool for modeling and analyzing real-world phenomena.





