Objective

By the end of this lesson, you will be able to apply calculus concepts to solve problems related to Lego constructions.

Materials and Prep

- Lego bricks
- Paper and pencil
- Calculator (optional)

No prior knowledge of calculus is required, but basic understanding of algebra and geometry will be helpful.

Activities

1. Build a Lego tower and measure its height using a ruler. Record the height in centimeters.

   Now, imagine the tower is growing at a constant rate of 2 centimeters per second. How fast is the height of the tower changing after 10 seconds? Use the concept of derivatives to solve this problem.

2. Construct a Lego ramp and measure the angle of inclination using a protractor. Record the angle in degrees.

   Assume a Lego car is rolling down the ramp at a constant speed. How fast is the car's horizontal position changing with respect to time? Use trigonometry and derivatives to find the answer.

3. Build a Lego bridge and measure its length using a ruler. Record the length in centimeters.

   Suppose the bridge is made of elastic Lego bricks that stretch. If a force of 5 Newtons is applied to the bridge, how much does the length of the bridge change? Apply the concept of elasticity and derivatives to solve this problem.

Ninth Grade Talking Points

- "Calculus is a branch of mathematics that deals with rates of change and accumulation of quantities."
- "Derivatives are used to find rates of change, while integrals are used to find accumulations."
- "In the first activity, we used derivatives to find the rate at which the height of the Lego tower was changing."
- "The second activity involved using trigonometry and derivatives to determine the car's horizontal position change."
- "Finally, in the third activity, we applied the concept of elasticity and derivatives to calculate the change in length of the Lego bridge."
- "Understanding calculus can help us solve real-world problems and analyze how things change over time."
- "By applying calculus to Lego constructions, we can explore the mathematical principles behind their design and functionality."