Student Activity: Height vs. Bounce

Overview: Students can develop understanding of exponentials with real-world examples of exponential functions.

Objective: **Mathematical Models with Applications TEKS:**
2A, 3A

Terms: Exponential function

Materials: Basketballs, tape measures or yardsticks, tape, and graphing calculator

Procedures: **Activity: Height vs. Bounce**
1. A basketball falls from the rim and bounces back 80% of its original distance from the floor with each bounce. Complete the table.

Bounce	Height (feet)
0	10
1	8
2	604
3	5.12
4	4.096
5	3.2768

  a. When is the ball 5 feet from the floor? [about the third bounce]
  b. When is the ball 1 foot from the floor? [tenth bounce]
  c. Write a function for the height in terms of the bounce.
   $[y = 10 \cdot 0.8^x]$

2. Have students take successive quotients and find a model of the form $y = ab^x$.

Summary: In this activity, students learn to apply the exponential decay model to a bouncing ball.

Height vs. Bounce

1. A basketball falls from the rim and bounces back 80% of its original distance from the floor with each bounce. Complete the table.

Bounce	Height (feet)
0	10
1	
2	
3	
4	
5	

    a. When is the ball 5 feet from the floor?

    b. When is the ball 1 foot from the floor?

    c. Write a function for the height in terms of the bounce.

2. Attach a tape measure to a vertical wall. Drop a ball from a height and record the height at each bounce.

Bounce	Height (feet)	Successive Quotients
0		
1		
2		
3		
4		
5		

    a. Compute successive quotients.

    b. What is a reasonable return rate?

    c. Build a scatter plot of the data with your calculator.

    d. Use your return rate to fit the data with an exponential function. Record the function here.