

MIXED REVIEW of Problem Solving

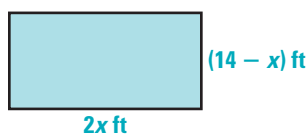


Make sense of problems and persevere in solving them.

1. **MULTI-STEP PROBLEM** A company's yearly profits from 1996 to 2006 can be modeled by the function $y = x^2 - 8x + 80$ where y is the profit (in thousands of dollars) and x is the number of years since 1996.

- In what year did the company experience its lowest yearly profit?
- What was the lowest yearly profit?

2. **MULTI-STEP PROBLEM** Use the rectangle below.



- Find the value of x that gives the greatest possible area of the rectangle.
 - What is the greatest possible area of the rectangle?
3. **EXTENDED RESPONSE** You throw a lacrosse ball twice using a lacrosse stick.



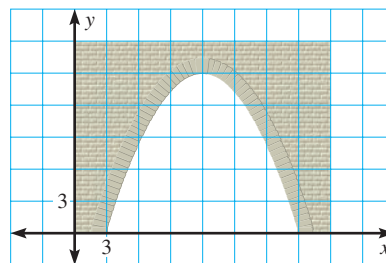
- For your first throw, the ball is released 8 feet above the ground with an initial vertical velocity of 35 feet per second. Use the vertical motion model to write an equation for the height h (in feet) of the ball as a function of time t (in seconds).
- For your second throw, the ball is released 7 feet above the ground with an initial vertical velocity of 45 feet per second. Use the vertical motion model to write an equation for the height h (in feet) of the ball as a function of time t (in seconds).
- If no one catches either throw, for which throw is the ball in the air longer? *Explain.*

4. **OPEN-ENDED** Describe a real-world situation of an object being dropped. Then write an equation that models the height of the object as a function of time. Use the equation to determine the time it takes the object to hit the ground.

5. **SHORT RESPONSE** A football player is attempting a field goal. The path of the kicked football can be modeled by the graph of $y = -0.03x^2 + 1.8x$ where x is the horizontal distance (in yards) traveled by the football and y is the corresponding height (in feet) of the football. Will the football pass over the goal post that is 10 feet above the ground and 45 yards away? *Explain.*

6. **GRIDDED ANSWER** The force F (in newtons) a rider feels while a train goes around a curve is given by $F = \frac{mv^2}{r}$ where m is the mass (in kilograms) of the rider, v is the velocity (in meters per second) of the train, and r is the radius (in meters) of the curve. A rider with a mass of 75 kilograms experiences a force of 18,150 newtons, while going around a curve that has a radius of 8 meters. Find the velocity (in meters per second) the train travels around the curve.

7. **SHORT RESPONSE** The opening of the tunnel shown can be modeled by the graph of the equation $y = -0.18x^2 + 4.4x - 12$ where x and y are measured in feet.



- Find the maximum height of the tunnel.
- A semi trailer is 7.5 feet wide, and the top of the trailer is 10.5 feet above the ground. Given that traffic travels one way on one lane through the center of the tunnel, will the semi trailer fit through the opening of the tunnel? *Explain.*