

1. A square and rectangle have the same area. The length of the rectangle is 5 inches more than twice the length of a side of the square. The width of the rectangle is 6 inches less than the length of a side of the square. Find the length of a side of the square.

2. The length of Mr. Gonzalez's rectangular carrot patch is 2 less than twice its width. The area of the garden is 420 square feet, but in order to sabotage Peter Cottontail's annoying thefts from the garden, Mr. Gonzalez wants to install a 2-foot-wide irrigation ditch all the way around the garden.
- a) Find the dimensions (length and width) of the garden.
 - b) Find the perimeter of the garden's planned irrigation ditch.

3. The profit of Mr. Unlucky's company represented by the equation $y = -3x^2 + 18x - 4$, where y is the amount of profit in millions dollars and x is the number of years of operations. He realizes his company is on the downturn and wishes to sell it before he ends up in debt.

a) When will Unlucky's business show the maximum profit?

b) What is that maximum profit?

c) At what time will it be too late to sell his business? (When will he start losing money?)

4. Abigail, who has a bionic arm, is crossing a bridge over a small gorge and decides to toss a coin into the stream below for luck. The distance of the coin above the water can be modeled by the function $y = -16x^2 + 96x + 112$, where x measures time in seconds and y measures the height, in feet, above the water.

a) Find the greatest height the coin reaches before it drops into the water below.

b) Find the time at which the coin hits the water.

5. At a swim meet, Janet dives from a diving board that is 48 feet high. Her position above the water is represented by the equation $y = -16x^2 + 24x + 40$, where x represents the time in seconds and y represents the height above the water.
- a) After how many seconds does Janet enter the water (Hint: the height above the water would equal zero.)
- b) What is the greatest height that Janet reaches in her dive?

6. American astronauts working on a space station on the moon toss a ball into the air. The height of the ball is represented by the equation $y = -2.7x^2 + 13.5x + 14$, where x represents the number of seconds since the ball was thrown and y represents the height of the ball in feet.

a) To the nearest tenth of a second, after how much time does the ball hit the ground?

b) To the nearest tenth of a foot, what is the greatest height the ball achieves?

7. Pierre throws a coin into the air from the top of the Eiffel Tower in Paris. The coin's motion is described by the equation $y = -4.9x^2 + 19x + 300$, where y represents the height in meters and x represents the time in seconds.

- a) How long after being thrown upward does the coin land, to the nearest second?
- b) What is the coin's maximum height to the nearest meter?