

1. When marketing the "Quadratics for Dummies" book, the publisher realized that the following could be used to predict sales at a local store: $sales = 100 - x$, where x was the price for each book. The expenses of the publisher to produce the book total \$1,344.

Recall: $profit = income - expenses$,
or $profit = (sales)x - expenses$.

a) Write the profit equation for the "Quadratics for Dummies" book in terms of x .

$$P = (100 - x)(x) - 1344$$

b) Write an inequality to represent the prices at which the publisher would earn a positive profit.

$$(100 - x)(x) - 1344 > 0$$

c) Solve the above inequality. Write your answer both as an inequality and using interval notation.

$$16 < x < 84 \quad (16, 84)$$

2. A model rocket is launched straight upward from ground level with an initial velocity of 128 feet per second. It is possible to model the height of the rocket (ignoring air resistance) with the function: $h(t) = -16t^2 + 128t$.

a. Factor the equation.

$$h(t) = -16t(t - 8)$$

b. Use the equation to determine how long will it take for the rocket to return to the ground.

$$t = 8 \text{ sec.}$$

c. After how many seconds will the rocket first be 112 feet above the ground? At what later time will it also be at that height?

$$t = 1 \text{ sec.} \quad \text{and} \quad t = 7 \text{ sec.}$$

3. An open box is made from an 8- by-10 inch rectangular piece of cardboard by cutting squares from each corner and folding up the sides.

a) If x represents the side length of the squares, what expression would represent the length of the box with the two squares removed?

$$8 - 2x$$

b) What expression would represent the width of the box with the squares removed?

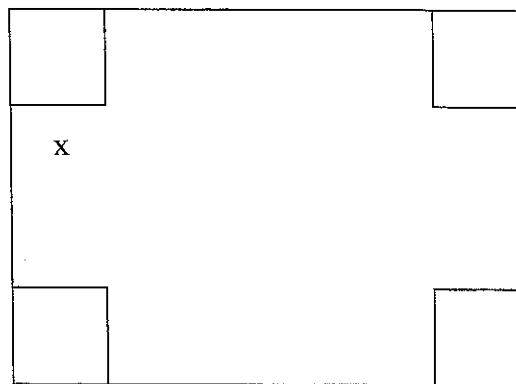
$$10 - 2x$$

c) What would the measure of the sides of the squares removed need to be in order to make the volume of the box created exactly 40 cubic inches? (Round to the nearest 10th of an inch)

$$40 = (x)(8 - 2x)(10 - 2x)$$

$$x \approx .7, 2.4$$

← 10 inches →



↑ 8 inches ↓

4. Taj placed \$3,500 in the bank offering an 8% interest rate compounded continuously. How many years will it take him to reach a balance of \$4,200?

$$4200 = 3500e^{.08t}$$

$t \approx 2.3$ years

5. Aliyah has \$8,200 to invest at her local bank. She plans to invest for 12 years at an interest rate that is compounded monthly. What would the interest rate be if she ended with \$9300.60 after the 12 years?

$$9300.60 = 8200 \left(1 + \frac{r}{12}\right)^{12(12)}$$

$$r \approx 1.05\%$$

6. Sasha is speeding in her car, and sees a parked police car on the side of the road right next to her at $t=0$ seconds. She immediately decelerates, but the police car accelerates to catch up with her. (Assume the two cars are going in the same direction in parallel paths). The distance that Sasha has traveled in feet after t seconds can be modeled by the equation

$d(t) = 150 + 75t - 1.2t^2$. The distance that the police car travels after t seconds can be modeled by the equation $d(t) = 4t^2$.

a) How long will it take the police car to catch up to Sasha?

$$150 + 75t - 1.2t^2 = 4t^2$$

$$t \approx 16.2 \text{ sec.}$$

b) How many feet has Sasha's car traveled from the time she saw the police car (time $t=0$) until the police car catches up to her?

$$1050.2 \text{ ft.}$$

7. A convection oven can cook a day's worth of bakery items 1.25 times faster than a conventional oven. When both ovens are used, they can finish the baking in five hours. How long would it take to bake the items if only the conventional oven is used?

$$\frac{1}{1.25t} + \frac{1}{t} = \frac{1}{5}$$

$$\text{LCD} = 5t$$

$$\frac{1}{1.25t} \left(\frac{4}{4}\right) + \frac{1}{t} \left(\frac{5}{5}\right) = \frac{1}{5} \left(\frac{5}{t}\right)$$

$$4 + 5 = t$$

$$9 = t$$

$$\boxed{11.25 \text{ hrs}}$$