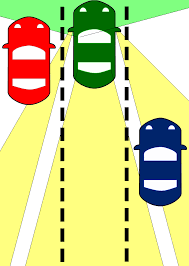
# Practice Exercises using Quadratics

## Braking Distance

The braking distance in feet required to stop a car traveling at miles per hour on dry level pavement can be approximated by . If the braking distance is 44 feet, calculate the speed of the car.[[1]](#footnote-1)

## Blind Spots



All cars have a blind spot where it is difficult for the driver to see a car behind and to the right. The area of the rectangular blind spot shown is 54 ft2. Its length is 3 feet longer than its width. Find its dimensions. [[2]](#footnote-2)

Firework Shows

Organizers of firework shows use of quadratic and linear equations to help them design their programs and provide for the safety of the audience. Shells contain the chemicals that produce the bursts we see in the sky. At a firework show, the shells are shot from mortars and when the chemicals inside the shells ignite, they explode, producing the brilliant bursts we see in the night sky.

At a fireworks show, a 3-inch shell is shot from a mortar at an angle of 75°. The height, *y*, (in feet), of the shell *t* seconds after being shot from the mortar is given by the quadratic equation:

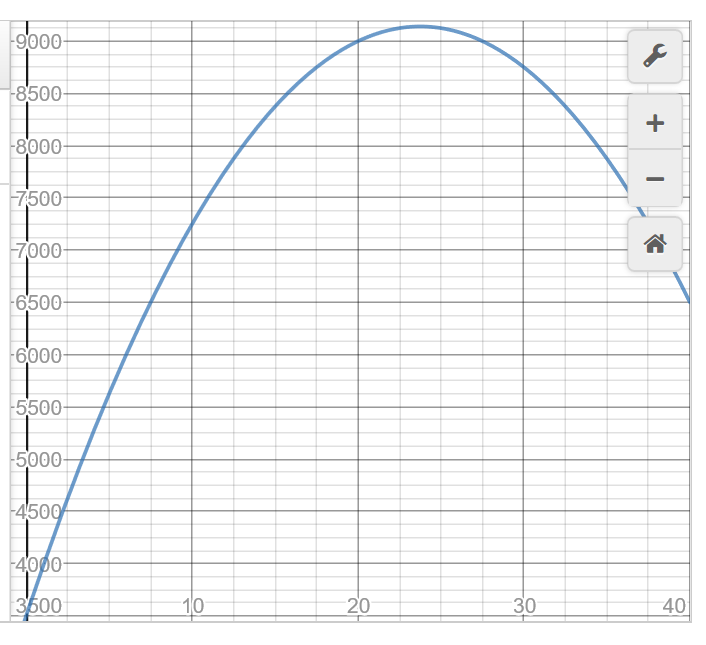
And the horizontal distance of the shell from the mortar, *x* (in feet), is given by the linear equation:

1. How high is the shell after 3 seconds?
2. What is the shell’s horizontal distance from the mortar after 3 seconds?
3. The shells are designed to explode at their maximum height in flight. How high is the shell when it bursts after 4.5 seconds?
4. What is the shell’s horizontal distance from its launching point when it explodes?
5. If the shell doesn’t explode, what is the shell’s horizontal distance from its launching point when it hits the ground? [[3]](#footnote-3)

## Endangered Species

The crocodile, an endangered species, is the subject of a protection program. The mathematical model  descries the crocodile population after *t* years of the protection program.

1. How long will the program have to be continued to bring the population up to 7250?
2. The graph of the crocodile population as a function of time is shown here. [[4]](#footnote-4) Identify the ordered pair on the function’s graph corresponding to your solution in part (a).
3. Interpret the meaning of the solution? [[5]](#footnote-5)



## Road Speed

Safety research uses the model  to estimate the shortest distance in feet, , in which a car can be stopped at various speeds, (miles per hour). If it took a car 550 feet to stop, estimate the car’s speed at the moment the brakes were applied.[[6]](#footnote-6)

## Emergency Relief

At times when emergency supplies are needed in an area whose terrain doesn’t support a landing strip, supplies must be dropped. How long will it take a package of medical supplies to reach the ground if it is released from a plane at an altitude of 1600 ft.? The initial velocity is 0 ft/sec so that the distance, *d*, of the object from the ground *t* seconds after it is released is given by  [[7]](#footnote-7)

## Air Pollution

The amount of particulate pollution in the air depends on the wind speed , among other things, with the relationship between and approximated by , where is in ounces per cubic yard and is in miles per hour. Interpret the and intercepts. [[8]](#footnote-8)

## Drug Sensitivity

Chart, line chart

Description automatically generatedThe sensitivity to a drug is related to the dosage size, , is represented by .

Find when . Interpret the solution. Since this equation is a parabola (and parabola are symmetrical) can you find the dosage that give the maximum effect. [[9]](#footnote-9)

## Adventure Course



A builder of a high ropes adventure course wants to include a rope ladder whose length is 8 meters longer than the horizontal distance between the base of the ladder and the top of the tower. The vertical height is one meter less than the ladder itself. How high is the top of the ladder?

## Architecture

A picture containing sky, outdoor, nature, rainbow

Description automatically generatedThe shape of the famous “Gateway to the West” arch in Saint Louis (Shown on the right [[10]](#footnote-10)) can be modeled by a parabola. The equation for one such parabola is: where x and y are in feet. Approximately how far do you have to walk to get from one side of the arch to the other? [[11]](#footnote-11)

1. Modified from: Gary K. Rockswold and Terry A. Krieger. Beginning & Intermediate Algebra. Pearson Education, Inc. 2013. pg 400. [↑](#footnote-ref-1)
2. Modified from: Alan S. Tussy, R. David Gustafson. Elementary Algebra. Thomson Brooks/Cole. 2008. (pg 550) [↑](#footnote-ref-2)
3. Sherri Messersmith, Robert S. Feldman. Beginning & Intermediate Algebra. McGraw Hill 2016. (pg 497) [↑](#footnote-ref-3)
4. <https://www.graphcalc.com/online-graphing-calculator/> [↑](#footnote-ref-4)
5. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. Pg 549. [↑](#footnote-ref-5)
6. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. Pg 719 [↑](#footnote-ref-6)
7. Modified from: Richard N. Aufmann, Joanne S. Lockwood. Beginning & Intermediate Algebra. Cengage Learning. 2013.pg 401. [↑](#footnote-ref-7)
8. Harshbarger, Ronald J. and Lisa S. Yocco. College Algebra in Context, 4th Edition. Pearson. 2013. pg 181. [↑](#footnote-ref-8)
9. Modified from: Harshbarger, Ronald J. and Lisa S. Yocco. College Algebra in Context, 4th Edition. Pearson. 2013. pg 181. [↑](#footnote-ref-9)
10. <https://commons.wikimedia.org/wiki/File:Gateway_Arch,_St._Louis,_Missouri.jpg> [↑](#footnote-ref-10)
11. McKaegue, Charles P. Intermediate Algebra, eighth edition. Thomson Brooks/Cole. 2008. pg. 503. [↑](#footnote-ref-11)