# Practice Problems – Evaluating Radicals

## Water Supply

Evaporation occurs when the sun’s heat causes the lake’s water molecules to gain enough energy to escape from the lake. The amount of evaporation, in inches per day, of a large body of water can be modeled by the formula where *a* is the surface area of the water in square miles, *w* is the average wind speed of the air over the water in miles per hour, and *E* is evaporation in inches per day. Determine the evaporation on a lake whose surface area is 9 square miles on a day when the wind speed over the water is 10 miles per hour. [[1]](#footnote-1)

This can become a key concern when working to provide clean water solutions to developing communities. Just when will capacity from other water sources need to be increased because of the evaporation of a local water source.

see: <https://www.actionagainsthunger.org/story/no-water-and-no-harvest-somalia-drought>

## Vehicle Speed

Police use the model to estimate the speed of a car (v, in miles per hour) with the length (*L*, in feet) of its skid marks on dry pavement. What is a reasonable estimate for a car’s speed if skid marks measure 225 feet? If the posted speed limit is 50 miles per hour and the motorist tells the officer he was not speeding, should the officer believe him? [[2]](#footnote-2) [[3]](#footnote-3)

## Road Safety - Bikes

What is the maximum velocity that a racing cyclist can turn a corner without tipping over? The answer is provided by the mathematical model where *v* is the maximum velocity in miles per hours and *r* is the radius of the corner, in feet. What is the maximum velocity that a cyclist should travel around a corner of radius 9 feet without tipping over? [[4]](#footnote-4)

**Related videos:**

<https://www.youtube.com/watch?v=hRM3bFXlyNk>; <https://www.youtube.com/watch?v=aPsVl42tqYo>

## **Water through a Fire Hose**

The rate at which water flows through a particular fire hose, *R*, in gallons per minute, can be approximated by the formula , where *d* is the diameter of the nozzle, in inches, and *P* is the nozzle pressure, in pounds per square inch. If a nozzle has a diameter of 2.5 inches and the nozzle pressure is 80 pounds per square inch, find the flow rate. [[5]](#footnote-5)

## Windmills

The power generated by a windmill is related to the speed of the wind by the formula

, where *S* is the speed of the wind in miles per hour and *P* is the power in watts. Find the speed of the wind when the windmill is producing 80 watts of power. [[6]](#footnote-6)

## Road Safety - Cars

The maximum velocity (, in miles per hour) that an automobile can travel around a curve with a radius of feet without skidding is described by the If the curve has a radius of 250 feet, find the maximum velocity a car can travel around it without skidding. [[7]](#footnote-7)

## Infant Mortality Rate

The U.S. infant mortality rate has been declining steadily. The infant mortality rate, , defined as deaths per 1000 live births, can be estimated by the function where *t* is years since 1969 and . Find the infant mortality rate in 1970 and 1996. [[8]](#footnote-8)

What is the significance of the interval given for time?

<https://www.macrotrends.net/countries/USA/united-states/infant-mortality-rate>

1. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. pg. 641. [↑](#footnote-ref-1)
2. Ibid. pg. 645. [↑](#footnote-ref-2)
3. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. pg. 645. [↑](#footnote-ref-3)
4. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. pg. 639, 645. [↑](#footnote-ref-4)
5. Angel, Allen R. and Dennis c. Runde. Elementry and Intermediate Algera, 4th edition. Prentice Hall.2011. pg. 653. [↑](#footnote-ref-5)
6. Modified from: Alan S. Tussy, R. David Gustafson. Elementary Algebra. Thomson Brooks/Cole. 2008. Pg 720. [↑](#footnote-ref-6)
7. Robert Blitzer. Introductory Algebra for College Students. Prentice – Hall, Inc. 1998. pg. 685 [↑](#footnote-ref-7)
8. Modified from: Angel, Allen R. and Dennis c. Runde. Elementry and Intermediate Algera, 4th edition. Prentice Hall.2011.Pg. 662. [↑](#footnote-ref-8)