

## M2HL24 - Inverse Variation – Examples

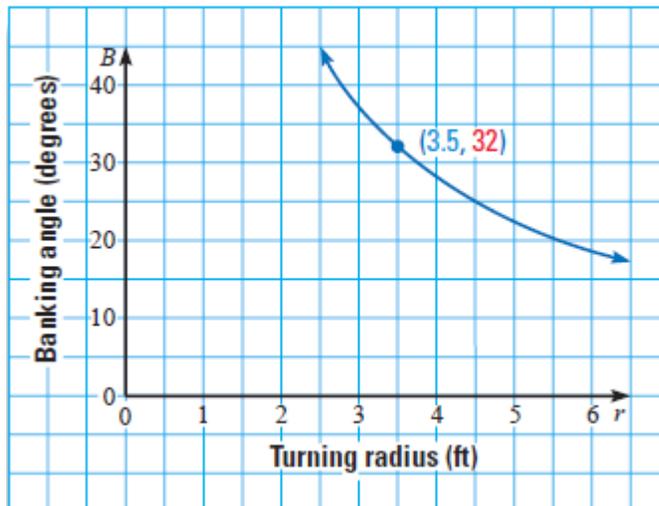
1. The number of hours,  $h$ , it takes for a block of ice to melt varies inversely as the temperature,  $t$ . If it takes 2 hours for a square inch of ice to melt at  $65^{\circ}$ , find the temperature at which it takes 7.25 hours to melt.
2. In kick boxing, it is found that the force,  $f$ , needed to break a board, varies inversely with the length,  $l$ , of the board. If it takes 5 lbs of pressure to break a board 2 feet long, how many pounds of pressure will it take to break a board that is 6 feet long?
3. Two fundamental topics covered in economics are supply and demand. Supply is the quantity that producers are willing to sell at a given price. For example, an artist may be willing to paint and sell 5 portraits if each sells for \$50. But that same artist may be willing to sell 100 portraits if each sells for \$10,000. Demand is the quantity of a good that consumers are not only willing to purchase but also have the capacity to buy at a given price. For example, consumers may purchase 1 Billion Big Macs from McDonalds every year, but perhaps only 1 million Fillet Minot's are sold at Outback. There may be 1 Billion people who want to buy the Fillet Minot but don't have the financial means to do so.

Economists study the equilibrium between supply and demand. Demand can be modeled with an *inverse variation* of price: when the price increases, demand decreases, and vice versa. If the number of potential buyers of a house in a particular city is inversely proportional to the price of the house, find a mathematical equation that describes the demand for houses as it relates to price. You are given that a \$100,000 home has a demand of 1,000 buyers and a \$400,000 home has a demand of 250 buyers. How many potential buyers will there be for a \$2M house?

4. Radiation machines, used to treat tumors, produce an intensity of radiation that varies inversely as the square of the distance from the machine. At 3 meters, the radiation intensity is 62.5 milliroentgens per hour. What is the intensity at a distance of 2.5 meters?
5. The number of miles per gallon of gasoline that a vehicle averages varies inversely as the average speed the car travels. A vehicle gets 13 miles per gallon at 52 mph. How many miles per gallon will it get at 64 mph?
6. An experiment was conducted involving a cyclist, runner, jogger and walker each completing a journey of 40 km. The results of the experiment are recorded in the table shown below.
  - a. Sketch a graph showing the relationship between  $v$  and  $t$ .
  - b. How long would a photon of light (Mr S typical running speed!!!) take to travel this distance?
  - c. How long would a three toed sloth (0.033 m/s ground speed) take to cover this distance
  - d. How fast would I need to travel if I wanted to cover the distance in 24 minutes?

Participant	Cyclist	Runner	Jogger	Walker
$v$ (Average speed in km/h)	40	20	10	5
$t$ (Time taken in hours)	1	2	4	8
$v \times t$	40	40	40	40

7. The graph below shows a model for the relationship between the banking angle and the turning radius for a bicycle traveling at a particular speed. For the values shown, the banking angle  $B$  and the turning radius  $r$  can be approximated by an inverse variation.
- Find an inverse variation model that approximately relates  $B$  and  $r$ .
  - Use the model to approximate the angle for a radius of 5 feet.
  - Use the graph to describe how the banking angle changes as the turning radius gets smaller.



- [http://www.youtube.com/watch?v=3oyUeiG\\_mt0&feature=related](http://www.youtube.com/watch?v=3oyUeiG_mt0&feature=related)
- <http://www.youtube.com/watch?v=fz6SrUgnjFQ&feature=related>
- <http://www.youtube.com/watch?v=BLEFnaxiCQg&feature=related>