

Applications of Quadratic Relations – Day 3

Example 1 – A Smorsche has a fuel consumption rate modeled by the equation $c = 0.003v^2 - 0.36v + 15$ where c represents the rate at which fuel is consumed (measured in litres per hundred kilometres) and v represents the driving speed (measured in kilometres per hour).

- a) Determine the driving speed that will minimize fuel consumption.
- b) Determine the minimum fuel consumption rate.
- c) Determine the fuel consumption rate when driving at 100 km/h.



Example 2 – A rectangular field is to be enclosed by 600 m of fencing. What dimensions will give the maximum area for the field? What is the maximum area of the field?

Example 3 – A large rectangular field is to be subdivided into three smaller plots using two fences parallel to two of the sides. The field itself also needs to be fenced and there is 400 metres of fence available.

a) Draw and label a diagram to illustrate this scenario.

b) Determine the maximum area of the field.

c) Determine the dimensions of the field that will maximize the area.

Homework – Please complete the questions below.

1. A farmer is planning to create a large rectangular pen and then subdivide it into two smaller pens using a fence parallel to one of the two sides.
 - a. If 600 yards of fencing is available, what is the maximum area of the pen that can be created?
 - b. What dimensions will maximize the pen?
2. Cooper wants to fence in his backyard to create a rectangular exercise area for his puppy. Cooper has 80 metres of fencing and will use the house as one of the sides of the rectangle. Find the dimensions that will create the maximum exercise area for Cooper's puppy.
3. A new hybrid car has a fuel consumption rate modeled by the equation $c = 0.004v^2 - 0.52v + 21.7$ where c represents the rate at which fuel is consumed (measured in litres per hundred kilometres) and v represents the driving speed (measured in kilometres per hour).
 - a. Determine the driving speed that will minimize fuel consumption.
 - b. Determine the minimum fuel consumption rate.
 - c. Determine the fuel consumption rate when driving at 90 km/h.
4. Emma sells her handmade jewellery at a local market. She has always sold her silver toe rings for \$10 each, but she is thinking about raising the price. Emma knows that her weekly revenue, R , in dollars is modeled by $R = -2n^2 + 5n + 250$, where n is the amount that she increases the price. What is the maximum revenue Emma can earn?
5. The cost, C , in dollars per hour, to run a machine can be modeled by $C = 0.01x^2 - 1.5x + 93.25$, where x is the number of items produced per hour. How many items should be produced each hour to minimize the cost?

Answers

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|------------------------------|----------------------------|------------------|
| 1a) 15000 yards ² | 1b) 100 yards by 150 yards | |
| 2) 20 m by 40 m | | |
| 3a) 65 km/h | 3b) 4.8 L/100km | 3c) 7.3 L/100 km |
| 4) \$253.13 | | |
| 5) 75 items | | |