



## Problem of the Week

### Grade 5 and 6

### Don't Fence Me In (Part 1)

#### Solution

#### Problem

Farmer Brown wants to fence a field for his 4 cows. They require 100 square metres of pasture.

- Determine the dimensions of all possible rectangular fields which would meet these requirements and have sides which are whole numbers.
- Are all of these choices sensible? Explain.

#### Solution

- To find the area of a rectangle, multiply the length and the width. Since the area of the field is 100 square metres, the length and the width of the field must be whole numbers that multiply to 100. Possible products are:

$$100 \times 1, 50 \times 2, 25 \times 4, 20 \times 5, 10 \times 10.$$

Therefore the possible dimensions of the field are  $100 \text{ m} \times 1 \text{ m}$ ,  $50 \text{ m} \times 2 \text{ m}$ ,  $25 \text{ m} \times 4 \text{ m}$ ,  $20 \text{ m} \times 5 \text{ m}$ ,  $10 \text{ m} \times 10 \text{ m}$ ,  $5 \text{ m} \times 20 \text{ m}$ ,  $4 \text{ m} \times 25 \text{ m}$ ,  $2 \text{ m} \times 50 \text{ m}$ , and  $1 \text{ m} \times 100 \text{ m}$ .

- Not all of these choices are sensible. Since most cows are about 2 metres long, pastures in which one of the dimensions is 1 m or 2 m would be too narrow for the cows to turn around.

#### Extension

If fencing costs \$10 per metre, which of these fields would be least expensive to fence? What is the shape of this field?

#### Solution to Extension

The choice of field with the least perimeter will be the least expensive to fence. Using the possible products in the order given in part (a) above, the perimeters are 202 m ( $2 \times 100 + 2 \times 1$ ), 104 m ( $2 \times 50 + 2 \times 2$ ), 58 m ( $2 \times 25 + 2 \times 4$ ), 50 m ( $2 \times 20 + 2 \times 5$ ), and 40 m ( $2 \times 10 + 2 \times 10$ ), respectively. Thus the field that is least expensive to fence is the square  $10 \text{ m} \times 10 \text{ m}$  field.

