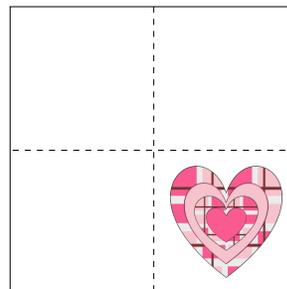# Problem of the Week
Problem B and Solution
Welcome to the Fold

Problem

Henry is folding paper to make Valentines.

a) He folds a square of paper along the vertical dashed line, and then along the horizontal dashed line.

   If the resulting smaller square (which is four layers thick) has a perimeter of 30 cm, what was the area of the original square of paper?

b) Henry wants to make a very special valentine for his Nana, by folding a rectangular piece of paper twice, as in part a). If he wants the folded paper to be a 10 cm by 15 cm rectangle, what shape and size of paper should he start with?

Solution

a) Since the perimeter of a square is four times its side length, the side length of the smaller square is $30 \div 4 = 7.5$ cm. The original square had side length twice that of the smaller square, i.e., $7.5 \times 2 = 15$ cm. Thus the area of the original square was $15 \times 15 = 225$ cm^2.

   Another way to determine the total area is to determine the area of the small square that was created by folding and then multiply this area by 4, since there are four congruent smaller squares. The smaller square has area $7.5 \times 7.5 = 56.25$ cm^2. Therefore the total area is $4 \times 56.25 = 225$ cm^2, as before.

b) Henry can only obtain a 10 cm by 15 cm rectangle by folding another, larger rectangle of paper. Since both the length and the width of the original rectangle will be halved by the two folds, he must start with a rectangle which has twice the length and width of the folded rectangle, i.e., a 20 cm by 30 cm rectangle of paper.