Pre-Thanksgiving Project

by Diane Amelotte

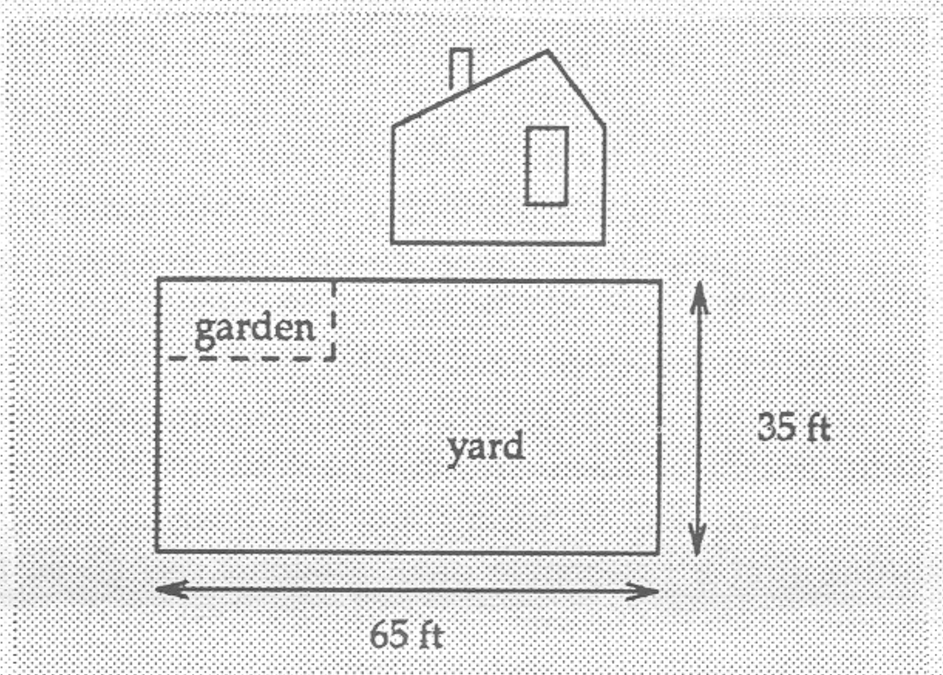
This is a lesson I designed for the three school days prior to Thanksgiving to hold the attention of my eighth grade pre-algebra classes. It is based on the following situation.

THANKSGIVING PROJECT: A new scientifically developed fertilizer called Harvest Plenty Soil Enhancer costs $175 for a bag that will fertilize an area of 240 square feet. Miles Standish IX wishes to fence in a garden with this area in a portion of his yard. The yard itself is a rectangle 65 feet by 35 feet. He must purchase the fertilizer, fence posts and the fencing. Pilgrim Hardware offers the best deal for fencing. They sell fencing from a huge roll of fencing, charging $3.95 per linear foot. To prevent the fence from sagging, it must be attached to fence posts which are at most 8 feet apart as well as a post in each corner of the garden. Each post costs $7.50.

The project involves experimentation with different garden layouts. On the first day, we warm up by reviewing the concept of factoring and how to count the factors of a given number (see p. 8). On the second day, we review counting factors, then students are divided into groups of four (I do this by handing out playing cards and grouping by face value). Each group of four has one "recorder" (I arbitrarily designate the student with the "club" as the recorder), who receives the description above and an instruction sheet for the group (see below). (Note: I vary parts of the given information. For example, some teams are asked to place posts no more than 12 feet apart and others have different prices for fencing and posts. This reduces interest in the results of neighboring teams.)

Instruction Sheet

Part I. Suppose that the following requirements must be met:
* the garden must be a rectangle;
* each dimension must be a nonzero whole number measured in feet;
* the area of the garden must be 240 square feet;
* two sides of the rectangle must be the north and west boundaries of the yard.



How many different layouts are possible?

Sketch each layout on your worksheet marking a dot wherever a post should be placed, using as few posts as possible. Record the length, width, and perimeter of each one and indicate how many posts are needed.

Part II. Determine which layouts are most expensive and least expensive. Justify your answer, for example by preparing an itemized list of the expenses including quantity and cost of each purchase for each layout, and finding the total cost of each layout.

Part III. Suppose that Miles has a budget of $525; which layout should he choose? (Give the dimensions.) What might be a valid reason for his not choosing the least expensive layout?

In Part 1, since $240 = 2^4 \times 3 \times 5$, there are 20 possible factors, giving 20 possible pairs for the length and width. However, because of the restrictive dimensions of the yard, only 11 of these give possible layouts.(I assume 8 x 30 and 30 x 8 are considered different layouts.)

(Continued on page 8)