

### Pentomino Farms

Pentominoes are shapes made of five squares, joined together edge to edge. There are 12 different shapes you can make if rotations and reflections are not considered different.

1) Using cubes or graph paper find all 12 pentominoes. Check with a classmate that they're all different. If you wish, make your own set using cardstock.

There are many different puzzles using pentominoes. Here are four challenges from Victor G. Feser of Saint Louis University. Use the 12 pentominoes to build a fence around a field in your farm. Pentominoes must touch edge to edge. For each type, what's the largest field you can enclose? (Each pentomino has an area of 5.)

- 2) A fence of any shape enclosing a field of any shape.
- 3) A fence of any shape enclosing a rectangular field.
- 4) A fence with a rectangular border enclosing a field of any shape.
- 5) A fence with a rectangular border enclosing a rectangular field.

For at least one of your solutions make a neat and artistic presentation that can go on the bulletin board! We're working with pentominoes that have unit squares of one square inch, but you can scale down to make your drawing if you wish. Include some sentences to explain what you did and what area your field is.

Here are some extra challenges relating to pentominoes:

- 6) Tile the 12 pentominoes to make a 6 by 10 rectangle. Record your solution!
- 7) Use nine pentominoes to make a three times larger model of a single pentomino. (Why are *nine* pentominoes needed for this job?)
- 8) Find all the hexominoes, made with six squares.
- 9) Have fun!

### The Dinner Party

"My wife and I attended a dinner party with four other married couples. At the party some people shook hands. No one shook hands with himself (or herself), no one shook hands with his (or her) spouse, and no one shook hands with the same person more than once. When the party was over I asked everyone, including my wife, how many people they had shaken hands with. To my surprise everyone gave me a different number. How many people did my wife shake hands with?"

This problem was devised by Lars Bertil Owe of Sweden. It's a great problem because it seems impossible, yet if you keep using what you know, you can solve it! Drawing a diagram can be a big help!

Write up your solution neatly and explain how you got it.

Have fun!

Source for Pentomino Farms and the Dinner Party: *Knotted Doughnuts* by Martin Gardner