

## Puzzle Corner

### Penning Ponies

by Dave Youngs

This month's *Puzzle Corner* activity is patterned after the classic match-stick puzzles which are an important part of the field of recreational mathematics. These puzzles come out of a rich historical tradition that dates back to the nineteenth century when matches were first manufactured. Invented in 1827 by the British chemist, John Walker, matches soon replaced the tinder boxes that people had formerly used to light fires. As matches became ubiquitous later in the century, they spawned a new form of entertainment—match-stick puzzles—which became quite popular when several match companies printed these puzzles on their boxes. Capitalizing on this interest, publishers began to print books of match-stick puzzles. By the early twentieth century, many people had developed a personal repertoire of these puzzles which they used to challenge friends and acquaintances.

In match-stick puzzles, the challenge is to move and/or remove a certain number of matches to create a new shape or arrangement. Doing this is easier for students who have well-developed spatial-relationship skills. Often, these students are not the top students in other areas, and their ability to solve these puzzles faster than their peers is a great esteem builder. Conversely, this type of puzzle often frustrates those students who usually do well at traditional school tasks, and provides them with a real challenge. This role reversal is often beneficial for both sets of students.

For safety's sake, the puzzle presented here uses paper clips instead of matches. Each student will need nine small paper clips and copies of the two activity sheets. The challenge in *Penning Ponies* is to move *only two* of the interior pen sections (paper clips) so that the four original pens become three

pens holding various combinations of ponies. For each of the combinations listed, there is at least one way to do this without any paper clips sticking out into the middle of a pen. When students get a solution, they should make a record of it on the sheet provided.

I hope that you and your students enjoy this challenge. The solution and another puzzle will appear next month.

#### February's Puzzle

We apologize for omitting the solutions to the February *Puzzle Corner* in last month's magazine. *The Three by Four Flip* challenged students to lay four cards face down and get all of them facing up by turning over three cards at a time. The challenge was to do this in the fewest possible number of moves. Our thanks to Mrs. Meaders from Christopher School in Chicago, Illinois, who sent us samples of her students' work. The four-step solution given below was discovered by Joshua Cruz, Claudia Cruz, Antonio Estrada, Ryan Greene, and Serina Moncada.

**Move one:** Flip cards 1, 3, 4

**Move two:** Flip cards 1, 2, 3

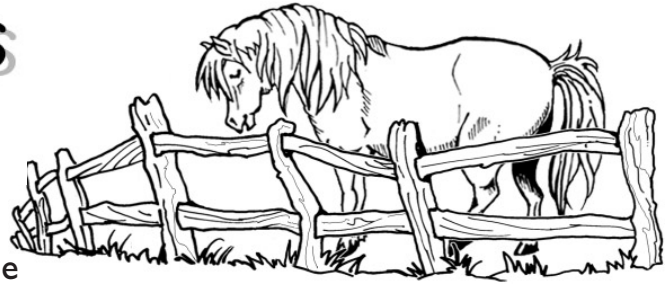
**Move three:** Flip cards 2, 3, 4

**Move four:** Flip cards 1, 2, 4

There are many other possible solutions to this problem, but each one will follow the pattern described in the following table.

Move	Flip Cards	Result
One	Any three	Three up, one down
Two	One facing down, two facing up	Two up, two down
Three	One facing down, two facing up	Three down, one up
Four	Three facing down	Four up

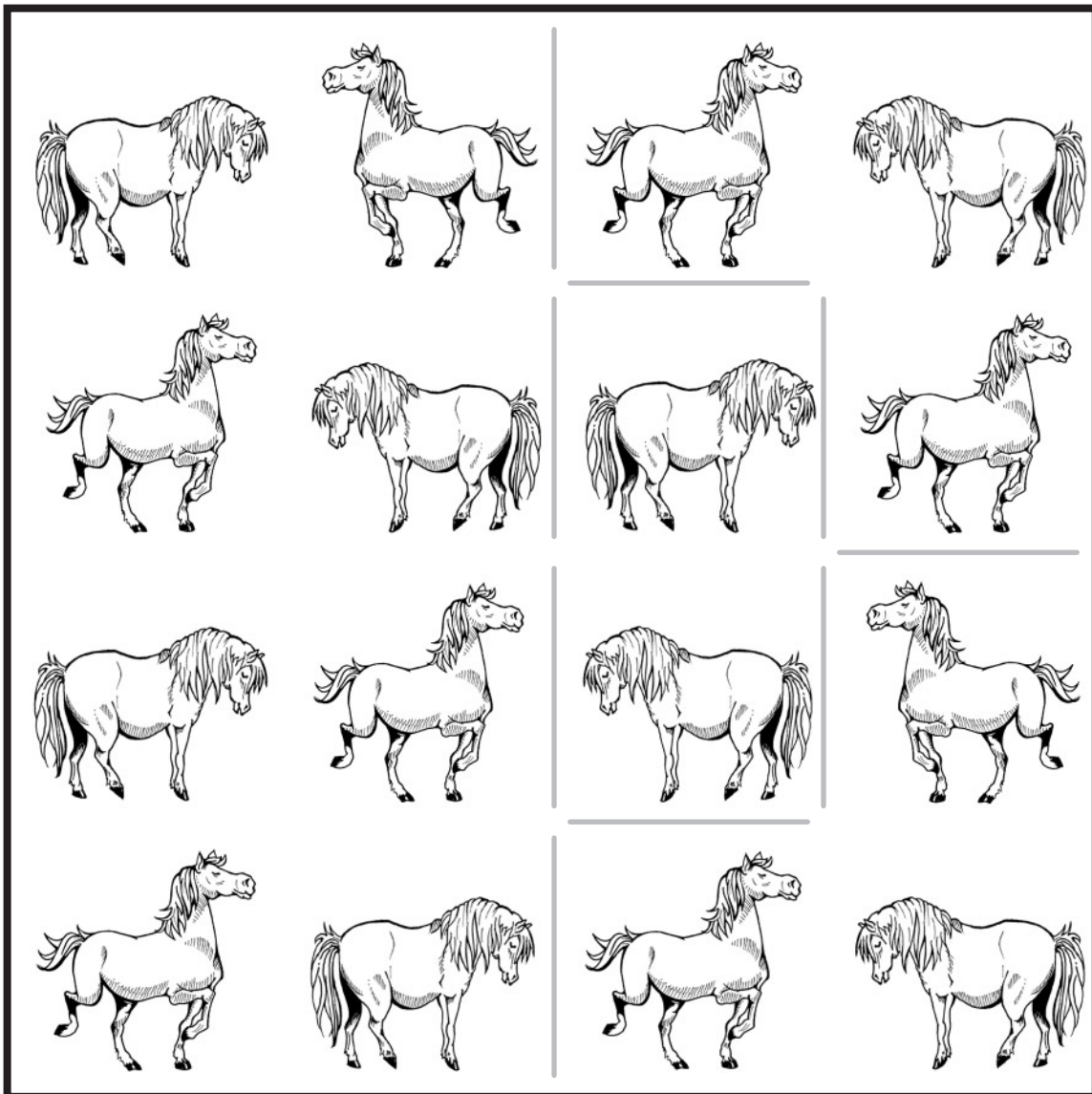
# Penning Ponies



There are 16 ponies in Rancher Ruth's corral. Place nine paper clips on the gray lines inside the corral to create four pens. How many ponies are in each pen?

Rancher Ruth wants to experiment with different arrangements of three pens, but she only wants to move two fence sections. Can you show her how to make each of the following arrangements by moving only two paperclips?

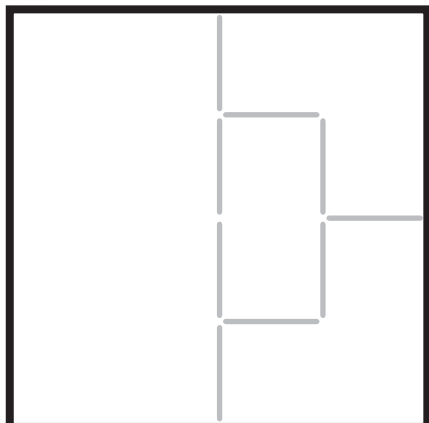
- Three pens holding:
- four, six, and six ponies.
  - two, five, and nine ponies.
  - two, seven, and seven ponies.
  - two, two, and 12 ponies.
  - three, six, and seven ponies.
  - two, six, and eight ponies.



Record each solution you discover in the spaces on the following page. Some problems may have more than one solution.

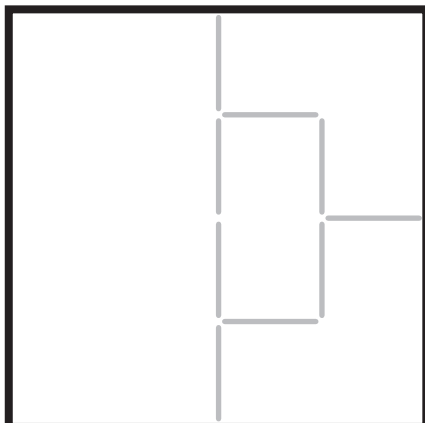
# Penning Ponies

Record each solution you discover in the spaces below. Some problems may have more than one solution.



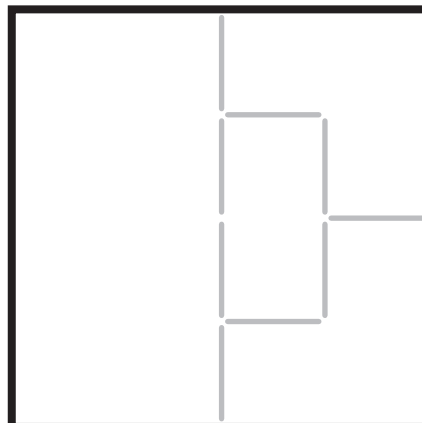
# of ponies in each pen:

\_\_\_\_\_



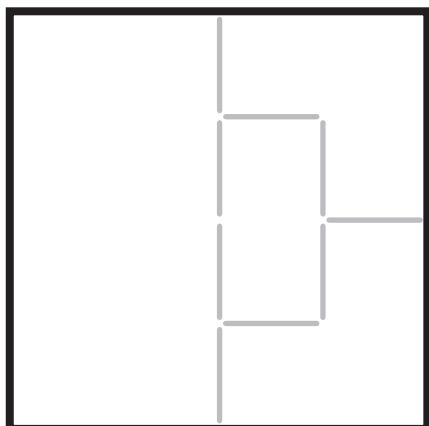
# of ponies in each pen:

\_\_\_\_\_



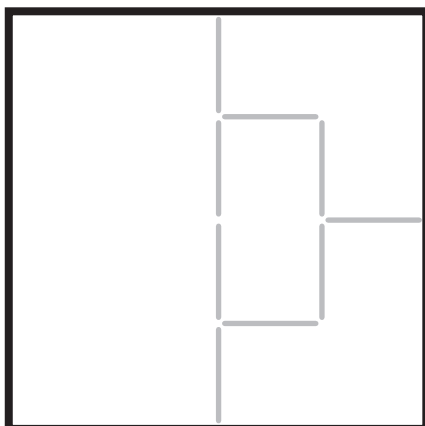
# of ponies in each pen:

\_\_\_\_\_



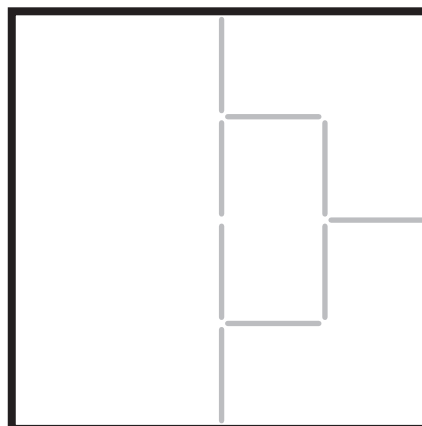
# of ponies in each pen:

\_\_\_\_\_



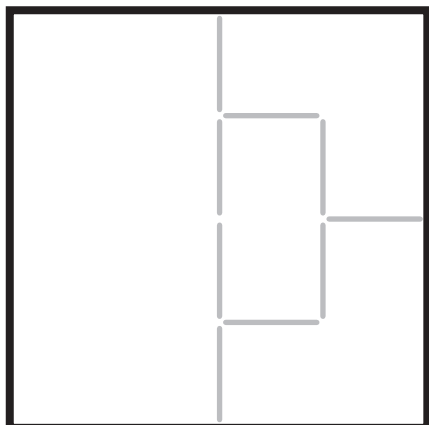
# of ponies in each pen:

\_\_\_\_\_



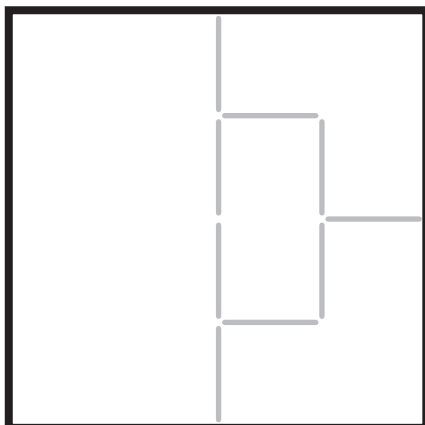
# of ponies in each pen:

\_\_\_\_\_



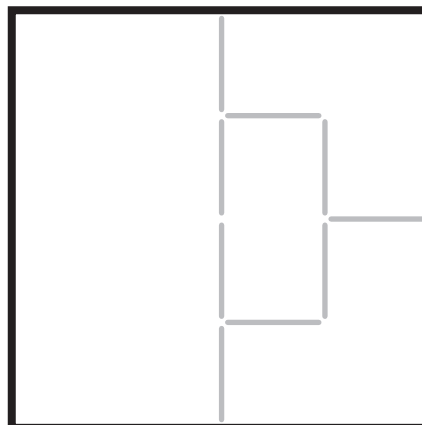
# of ponies in each pen:

\_\_\_\_\_



# of ponies in each pen:

\_\_\_\_\_



# of ponies in each pen:

\_\_\_\_\_