# Computer Science Olympiad
## Pennsylvania State University
### Hazleton Campus
### Second Round, Spring 2012

**Deadline**: April 27, 2012

## MMP: *A Math Puzzle*

Given a grid with the structure shown on the Figure 1.

| | x | | - | | = | 7 |
|---|---|---|---|---|---|---|
| + | | x | | + | | |
| | % | | x | | = | 8 |
| - | | + | | x | | |
| | % | | - | | = | -1 |
| = | | = | | = | | |
| 10 | | 10 | | 11 | | |

Fig. 1. A MMP puzzle

In this math puzzle (MMP), the grid cells contain numbers and arithmetic operations (% is the remainder operator). All numbers are only decimal digits (1 to 9). As it is shown in the MMP puzzle (Fig.1) you are given the operations and the answers (numbers) at the end of the respective rows and columns. You need to fill in all the cells that correspond to numbers such that the value of every horizontal and vertical expression to be equal to the numbers at the end of the rows and columns. You can see a possible solution on Fig.2.

| 5 | x | 2 | - | 3 | = | 7 |
|---|---|---|---|---|---|---|
| + | | x | | + | | |
| 9 | % | 4 | x | 8 | = | 8 |
| - | | + | | x | | |
| 4 | % | 2 | - | 1 | = | -1 |
| = | | = | | = | | |
| 10 | | 10 | | 11 | | |

Fig. 2. Solution of the MMP puzzle

**Problem 1.** [Puzzle Generator] Write a program that generates random MMPs, i.e. generates all operations and corresponding answers and checks for correct solutions.

**Problem 2.** [Puzzle Solver] Write a program that solves a random MMP. The input data for the program consists of arithmetic operations and corresponding answers at the end of the rows and columns.