

Mistakes are easy to make

Four students, Amy, Ben, Cai, and Dee, each tried to solve a different equation or system of equations during a math contest. Each student made a different type of mistake. One put in the wrong sign somewhere but found the correct number of solutions. One made an arithmetic error but found the correct number of solutions. One found an extraneous solution, that is, a number that solves a problem related to the original problem but does not in fact solve the original. One correctly found one solution but missed the other solution. Using the following clues, determine which student tried to solve which equation, and what type of mistake each one made. The problems they tried to solve are listed in the grid below. You can fill the grid with check marks and x's to keep track of what you know.

1. Each number that was part of a student's answer was a real number between -10 and 10
2. After the contest, one of them checked his or her answers by plugging them into the original problem with a calculator. It displayed an error message for one of the answers.
3. Ben had the correct number of solutions to his problem.
4. The arithmetic error affected a problem with exactly one solution.
5. Later, Dee looked at the three problems she didn't work on during the contest. She solved two of them right away using only algebra, but she asked the other students how to solve the third. They answered correctly, "You have to use a numerical solver. There's no formula or algebraic way to solve that one."
6. The student who solved the quadratic equation found two solutions, and used a calculator to compute the product of those numbers. The product came out right.
7. Amy usually sits next to the student who made the sign mistake. Together, they found a total of three solutions for their problems. Their problems do indeed have a total of three solutions.

	Amy	Ben	Cai	Dee	Sign	Arithmetic	Extraneous	Missed one
$x^2 - 10x + 7 = 0$								
$\frac{x^2 - 5x + 6}{x^2 + 2x - 8} = 0$								
$e^x - 2 = \frac{x}{10}$								
$10x + 20y = -3$ $5x + 8y = 1$								
Sign								
Arithmetic								
Extraneous								
Missed one								

Your solution:

Problem	Student	Which type of mistake
$x^2 - 10x + 7 = 0$		
$\frac{x^2 - 5x + 6}{x^2 + 2x - 8} = 0$		
$e^x - 2 = \frac{x}{10}$		
$10x + 20y = -3$ $5x + 8y = 1$		