Problem of the Week
Problem B and Solution
Subtraction Actions

Problem

Four students in Miss Noether's class are trying to solve the problem of subtracting 498 from 1397. Their attempts are shown below.
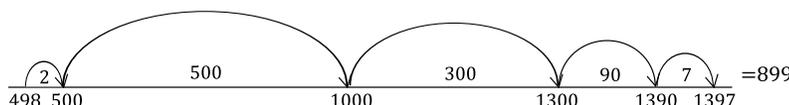
Samira:

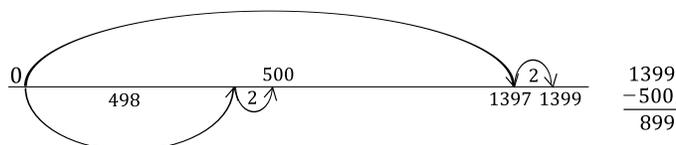$$\begin{array}{r} 1397 \\ -498 \\ \hline 101 \end{array}$$

Roger:

$$\begin{array}{r} 1000 + 300 + 90 + 7 \\ - \qquad 400 + 90 + 8 \\ \hline \end{array} = \begin{array}{r} 1000 + 200 + 180 + 17 \\ - \quad 300 + 100 + 90 + \;8 \\ \hline 700 + 100 + 90 + \;\;9 = 899 \end{array}$$

Beth:

Mandeep:

$$\begin{array}{r} 1399 \\ -500 \\ \hline 899 \end{array}$$

a) Explain what you think each student did to solve the problem. Explain any errors and show them in a different colour.

b) What is the correct answer for this problem?

c) How would *you* solve this problem?

Solution

a) **Samira** subtracted the upper number (1)397 from the lower number 498, ignoring the 1 in the thousands column. Thus her answer is incorrect.

   Roger wrote the larger number as a sum of the thousands + hundreds + tens + ones, and the smaller number as the sum of the hundreds + tens + ones. He wrote the 400 in the smaller number as $300 + 100$ in order to be able to subtract 300 from 1 000. He also wrote $300 + 90 + 7$ as $200 + 180 + 17$ to be able to subtract the hundreds, tens and ones columns. Finally, he added each of the differences, $700 + 100 + 90 + 9$, to obtain the overall difference, 899.

   Beth 'added up' from 498 to 1397, adding 2 (to get to 500), then 500 (to get to 1000), then 300 (to get to 1300), then 90 (to get to 1390), then 7, to reach 1397. Then she summed these numbers (2+500+300+90+7) to get the difference, 899.

   Mandeep wrote $1397 - 498 = 1397 + 2 - 498 - 2 = 1399 - 500 = 899$. The difference between 1397 and 498 is the same as the difference between 1399 and 500. Each of the two new numbers is two larger than the original two numbers so the difference between them will be the same.

b) The correct answer is 899, as shown by Roger, Beth, and Mandeep.

c) Answers will vary.