Problem of the Week
Problem C and Solution
Jumbled Numbers 1

Problem

Imani wrote a program that switches digits in numbers. Users enter a 4-digit number and then use the following buttons to switch digits in the number:

Button	Function
red	switches the thousands and tens digits
blue	switches the hundreds and units (ones) digits
yellow	switches the thousands and units (ones) digits

Imani enters the last four digits of her phone number, then presses the following sequence of buttons, in order from left to right.

red yellow blue red yellow

The number now shown is 2148.

Then, Imani restarts the program, enters the last four digits of her phone number again, and presses the following sequence of buttons, in order from left to right.

blue yellow red blue

What number is now shown?

Solution

First we need to determine the last four digits of Imani's phone number, as this is the number she entered into the program. We can determine this by working backwards starting with 2148, which is the number shown after all the buttons were pressed. We will then go through the buttons one by one, from last to first.

- To obtain 2148, the number must have been 8142 before pressing yellow.
- Then, the number must have been 4182 before pressing red.
- Then, the number must have been 4281 before pressing blue.
- Then, the number must have been 1284 before pressing yellow.
- Then, the number must have been 8214 before pressing red.

Thus, the last four digits of Imani's phone number are 8214.

Now we can determine the number shown after Imani entered 8214 and pressed the second sequence of buttons.

- The number will be 8412 after pressing blue.
- Then, the number will be 2418 after pressing yellow.
- Then, the number will be 1428 after pressing red.
- Then, the number will be 1824 after pressing blue.

Thus, the number 1824 is now shown.