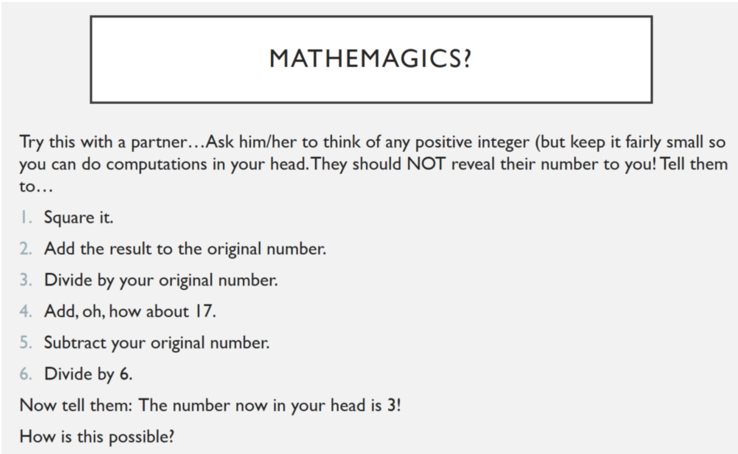
Two Algebra Problems



MATHEMAGICS?

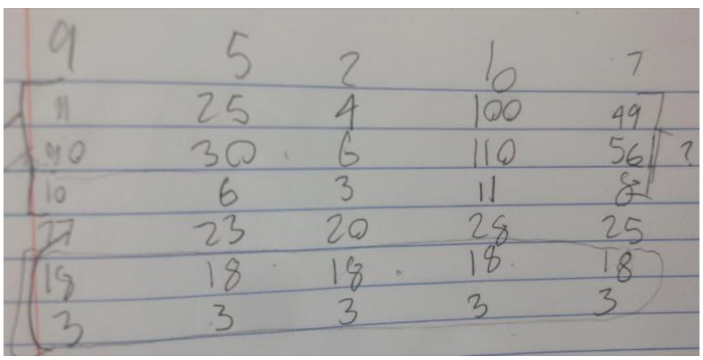
Try this with a partner…Ask him/her to think of any positive integer (but keep it fairly small so you can do computations in your head.They should NOT reveal their number to you! Tell them to…

1. Square it.
2. Add the result to the original number.
3. Divide by your original number.
4. Add, oh, how about 17.
5. Subtract your original number.
6. Divide by 6.

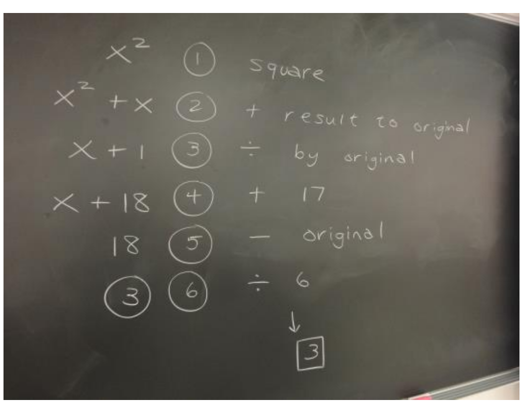
Now tell them: The number now in your head is 3!

How is this possible?

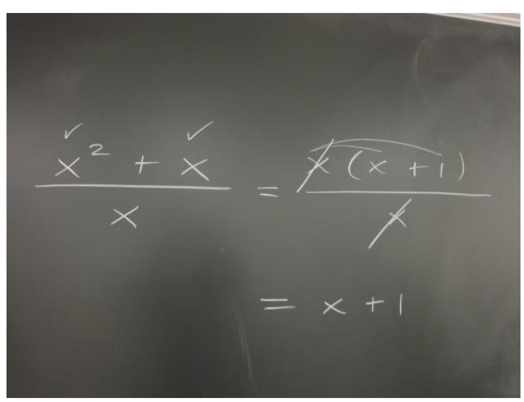
To begin, start with a concrete number such as 4. Below, you can see several iterations of this—starting with numbers 9, 5, 2, 10, and 7. After following the instructions, you get the number 3 every time (see the bottom row). Something is definitely going on here!



Further, you might notice that all the scenarios show an 18 before the 3 (look at the second line up from the bottom). One way to see why this happens is to generalize the starting number and call it x. Then carefully watch what happens to x as you go through the steps 1-6 in the problem:

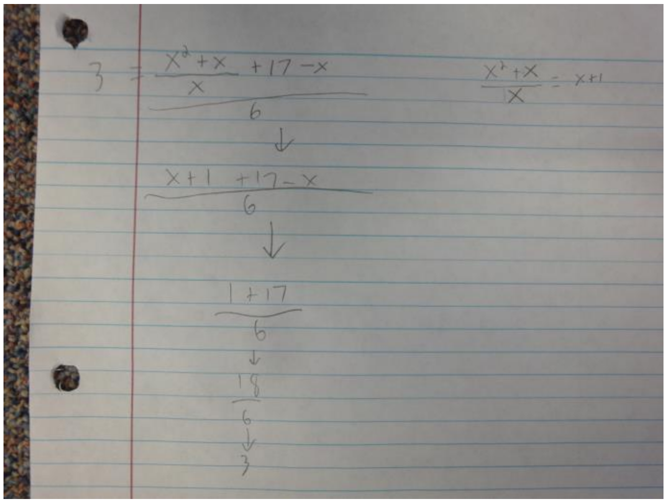


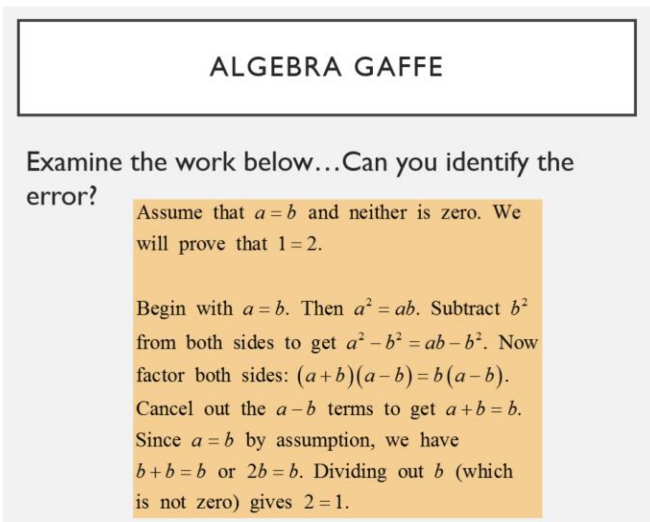
The six steps in detail.



The details for Step 3.

Some people chose to write one large expression for this process; it works! Study the details:





As we discussed in class, “canceling” the $a-b$ amounts to dividing by zero. Since division by zero is undefined, this explains the statement $2=1$.