Guess the Number

Certain sequences of arithmetic operations can lead to similar or identical results no matter what number you start with. The calculations may be easy — the point is to figure out how the results are related for different numbers and WHY. This is the essence of algebra:

Why do certain calculations give the same results for ALL numbers?

I. Guess the Number

Try the following activities with several different starting numbers to see what happens.

1. **Constants are Constant**

   Step 1: Pick a number.
   Step 2: Add 2 to the number.
   Step 3: Multiply the result by 3.
   Step 4: Add 9.
   Step 5: Divide the result by 3.
   Step 6: Subtract the number that you started with.

   Write down the final number. What do you notice after several examples?

2. **Constants are Still Constant**

   Step 1: Pick a number.
   Step 2: Subtract 3 from the number.
   Step 3: Divide the result by 2.
   Step 4: Add 5.
   Step 5: Multiply the result by 4.
   Step 6: Subtract twice the number that you started with.

   Write down the final number. What do you notice after several examples?

After doing a few examples, see if you can determine WHY the result of the sequence of calculations is what it is.

A good way to see why the procedure works is to carefully write out the calculations with your starting number in a box, without actually performing any calculations on that number. This allows you to follow what actually happens to your number.

For example, starting with 13 in the first procedure above, write

$$\boxed{13} + 2$$

(instead of 15) for Step 2, and then write

$$3 \cdot \left(\boxed{13} + 2\right) = 3 \cdot \boxed{13} + 6$$

(instead of 45) for Step 3, etc. Does it matter what number is put in the box?