**The “Magic” of Algebra**

Let’s play a game. Complete the table below using the number on your card. The mathemagician predicts that your final result will be 3 no matter what number you start with.

|  |  |
| --- | --- |
| **Step 1**: Write down your number. This is the *initial value*. |  |
| **Step 2**: Double your number. |  |
| **Step 3**: Add six to the answer. |  |
| **Step 4**: Divide the answer by 2. |  |
| **Step 5**: Subtract the *initial value* from the answer in Step 4. |  |

1. Did the mathemagician correctly guess the answer for Step 5?
2. Compare your answer for Step 5 to the other students. What do you notice?
3. Repeat the game again. This time start with the *opposite* of your initial value. Hint: If your initial value was 10, start with -10. If your initial value was -8, start with 8.

|  |  |
| --- | --- |
| **Step 1**: Write down your number. This is the *initial value*. |  |
| **Step 2**: Double your number. |  |
| **Step 3**: Add six to the answer. |  |
| **Step 4**: Divide the answer by 2. |  |
| **Step 5**: Subtract the *initial value* from the answer in Step 4. |  |

1. Will the final result of this game always be 3? Explain why or why not.

We will now investigate how this magic trick works. We will first represent the trick using a diagram.

* Copy the numbers from one of your tables on the first page into the column labeled *Numeric* below.

The column labeled *Pictoral* contains pictures representing what happened at each step. The *square* represents the initial value of the card and the *circle* represents the value of 1.

* Fill in the column labeled *Symbolic* based on what happens at each step. The initial value is represented by the variable *x*.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **KEY**:  |  | = initial value |  | = 1 |

|  |  |  |
| --- | --- | --- |
|  | **SPECIFIC** | **GENERAL** |
| Numeric | Pictoral | Symbolic |
| Step 1: Initial Value |  |  | *x* |
| Step 2: Double the number. |  |  |  |
| Step 3: Add six to the number. |  |  |  |
| Step 4: Divide the number by 2. |  |  |  |
| Step 5: Subtract the initial value. |  |  |  |

1. Explain how the mathemagician’s number trick works.
2. Would the trick work if the initial value was a decimal, fraction, or very large number? Explain why or why not.

The magic trick used a sequence of math operations in a particular order. We see that the order in which the operations are performed is very important.

1. Create your own magic trick. Your trick should include *four* mathematical operations. Write the magic trick below and make sure to include the final result of the trick. Use the table to check that your trick works.

|  |  |
| --- | --- |
| **Step 1**: Select any number. (Initial Value) |  |
| **Step 2**:  |  |
| **Step 3**:  |  |
| **Step 4**:  |  |
| **Step 5**:  |  |

 **FINAL RESULT OF TRICK =**

Represent your magic trick using the table below. Use a *square* to represent the initial value and a *circle* to represent the value of 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **KEY**:  |  | = initial value |  | = 1 |

|  |  |  |
| --- | --- | --- |
|  | **SPECIFIC** | **GENERAL** |
| Numeric | Pictoral | Symbolic |
| Step 1: Initial Value |  |  | *x* |
| Step 2:  |  |  |  |
| Step 3:  |  |  |  |
| Step 4:  |  |  |  |
| Step 5:  |  |  |  |