Lesson 3.4

Algebra Magic

You will need:

the Lab Gear 

MAGIC TRICKS

1. **Exploration** A magician asked everyone in the audience to think of a number. "Don't tell your number to anyone," she said. "Now do the following things to your number.

Step 1: Add the number to one more than the number.
Step 2: Add 7 to the result.
Step 3: Divide by 2.
Step 4: Subtract the original number.
Step 5: Divide by 4.

When you are finished, you should all have the same number"

What was the number, and how did the magician know it would be the same for everyone?

2. Try the following algebra magic problem. Record your result and compare it with others in your group. Do you all get the same answer, or does your answer depend on the number you started with?

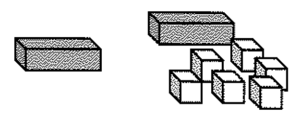
1) Think of a number.
2) Multiply the number by 3.
3) Add 8 more than the original number.
4) Divide by 4.
5) Subtract the original number.

3. Do the same trick, but change the final step to *subtract* 2. Compare answers with your group members again. Are they the same or different? Explain.

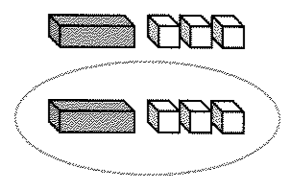
LAB GEAR MAGIC

The following trick has been modeled with t
Lab Gear.

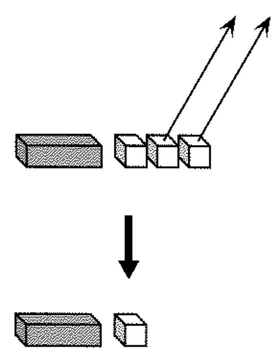
1) Think of a number.



2) Add 6 more than the original number
the number.



3) Divide by 2.
4) Subtract 2.



4. a. In this magic trick, do you think ever
one should end up with the same or d
ferent answers? Explain.

b. How will a person's answer be relate
to his or her original number? Explai

5. Do the following magic trick with the Lab Gear. Start with an x-block, which represents the number a person chose. Sketch each step and write it algebraically.
   1) Start with any number.
   2) Multiply the number by 4.
   3) Add 5.
   4) Subtract 1.
   5) Divide by 4.
   6) Subtract one more than the original number.

   Should everyone have the same result? If yes, what is it?

REVISING MAGIC TRICKS

6. Change the magic trick in problem 5 by reversing the order of Steps (3) and (4). Do you get the same answer as you did before? Explain.

7. Change the magic trick in problem 5 by reversing the order of Steps (2) and (3). Was this harder or easier than reversing Steps (3) and (4)? Explain.

8. Change the last step in problem 5 so that everyone ends up with the number they started out with.

9. Do the following algebraic magic trick. Which steps can you reverse without changing the result? Why?
   1) Think of a number.
   2) Subtract 7.
   3) Add 3 more than the number.
   4) Add 4.
   5) Multiply by 3.
   6) Divide by 6.

   You should end up with the original number.

INVENTING MAGIC TRICKS

The following trick has one step missing.
1) Think of a number.
2) Take its opposite.
3) Multiply by 2.
4) Subtract 2.
5) Divide by 2.
6) ?????

10. Use the Lab Gear to model the first five steps of this trick. Use y to represent the original number. Then translate each step into an algebraic expression. Compare your result after step (5) with your classmates' answers.

11. Decide what step (6) should be, so that the given condition is satisfied.
    a. The final result is one more than the original number.
    b. The final result is the opposite of the original number.
    c. The final result is always zero.
    d. The final result is always -1.

12. For each of these conditions, (a-d), make up an algebra magic trick with at least five steps.
    a. The final result is the original number.
    b. The final result is 2, regardless of what the original number was.
    c. The final result is the same, whether you do the steps backward or forward.
    d. The trick uses all four operations (multiplication, division, addition, subtraction).

13. **Summary** Choose one of the tricks you wrote in problem 12. Test your trick with three numbers, including a negative number and a fraction. Show your work. Use algebra to explain the trick.