

LessonTitle: Number Tricks and Algebra **Pre 5a.2**

Utah State Core Standard and Indicators Content Standards 1-2 Process Standards 1-5

Summary

In this lesson, students use spreadsheets to follow number trick (a series of operations on numbers of their choice—as in Pre 5a.1). They prove that no matter what number you choose, the final step in the sequence will always yield the same solution. They represent the steps in the number trick series using variables and numbers. This representation leads them to an understanding of the trick. They analyze why the number trick works.

<p style="text-align: center;">Enduring Understanding</p> <p>Algebra helps us represent and understand problems.</p>	<p style="text-align: center;">Essential Questions</p> <p>How does algebra help us represent and understand problems? How do we use algebra to help us work efficiently?</p>
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<p style="text-align: center;">Skill Focus</p> <ul style="list-style-type: none">• Variable expressions• Simplifying expressions, combining like terms, using the distributive property.	<p style="text-align: center;">Vocabulary Focus</p>
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Assessment ideas: “Students’ fluency and confidence in describing how to generalize the steps in a think-of-a-number puzzle provide insights into their readiness to move to more-formal work with symbols, which is the traditional notion of algebra.” (NCTM Navigating Through Algebra Grades 6-8)
Several activities which follow this lesson on the web site are excellent assessments.

Materials: Spreadsheet worksheet—see link. Calculators if desired.

Launch
Try the trick. Why?

Explore
Follow the worksheet for representing the trick.

Summarize
Be certain to formalize the skills they used, simplifying expressions, combining like terms, distributive property, problem solving. Then focus on the essential question—what is your answer to the essential question?

Apply
Practice
Go on to 5a.2 and then to lessons 5b.0 to 5b.2—don’t leave out 5b.2 Picture Frames!!

See directions below.

Directions:

After students have completed the table in Number 1 on the worksheet, then direct the students as to how to fill in the equations (tell the computer to write the steps in symbols)

- Go to cell B4 to enter the formula—see below,
 - enter = , then click on cell B2—it will automatically enter B2,
 - then the +,
 - then click on B2 again, then -1.
 - Proceed to the next step in cell B6.
 - Continue as shown below--Make certain to lead the students with questions as you write the first equations together.
- To copy and paste the equations to the other columns,
 - Highlight cell B4 down through B10. Copy.
 - Highlight from cell C4 diagonally to F10 (or the lowest right hand cell). Then paste. MAGIC—the process is repeated for all numbers.
- Next have students compare their results for all the different numbers..

	A	B	C	D	E	F
1						
2	Write down any whole number	5	23	88	125	65
3						
4	Add the number that is 1 less than the original number	= B2 + B2 - 1				
5						
6	Add 9 to this result	= B4 + 9				
7						
8	Divide the sum by 2	= B6 / 2				
9						
10	Subtract the original number	= B8 - B2				

Number Tricks and Algebra

1. Try this number trick. Pick your number—follow the steps below.

Will your answer be the same no matter what number you pick? Why or why not?

- After you write the steps in symbols, be sure to rearrange them (combine like terms).
- When you write the steps in numbers, be sure to show all your operations.

Number Tricks		
Steps (in words)	Steps (in symbols)	Steps (in numbers)
Write down any whole number	n	(You pick)
Add the number that is 1 less than the original number		
Add 9 to this result.		
Divide the sum by 2		
Subtract the original number. What is the final result?		

2. How can you prove that the final answer will be the same, no matter what number you choose? Let's try some spreadsheet MAGIC. On the computer, open up the spreadsheet worksheet your teacher has prepared for you.

- First, choose several different numbers. Record them in the “write down any number” row.
- Second, tell the computer to follow the symbol steps you created above—you will have to do this using spreadsheet format. Your teacher will help you get started.
- Copy and paste your formulas for all your numbers.
- Compare your results with the other students in the classroom. **Explain the results below!**

3. Create your own number trick. Work as a team of two. Then exchange tricks with another team of two. Try it on a spreadsheet if desired.

Number Tricks		
Steps (in words)	Steps (in symbols)	Steps (in numbers)
Write down any whole number	n	You pick

4. Is there a secret to creating a number trick in which every number you choose produces the same answer?

5. What do you think about algebra and number tricks? Why do we have algebra?