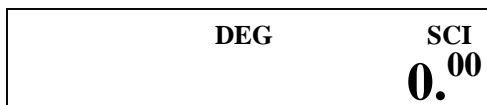


Investigating the First Law of Exponents

Before beginning this exercise, set your calculator in the scientific mode with one significant digit. To do this, press MODE, 8, 1. Mode 8 is the mode for scientific calculation, and 1 indicates how many significant digits will be displayed. The screen should look like this.



Enter 100 (100 =). The display should look like this: 1.0^2

This is read "one times ten to the second power." Since one times any number is the same as the number itself, the display could also be read "ten to the second power."

The power key (x^y) can be used to raise a number to a power. Use the keystrokes shown below to raise ten to the second power.

1
0
 x^y
2
=

Notice that the display looks the same.

Use the power key to raise ten to the seventh power. Write what is displayed on the screen and how it would be read.

The display is _____, and this is read _____

How would a display of 1.25 be read? _____

Check your answers to the above questions before continuing.

You are now going to use the calculator to explore what is known as the first law of exponents.

Complete the table below using your calculator set to display numbers in scientific mode with one significant digit (MODE 8,1). The keystrokes, the display of the result, how the display is read, and what you should write for the first entry are all shown below the table.

$(10^5)(10^4) =$		$(10^{10})(10^3) =$	
$(10^7)(10^3) =$		$(10^8)(10^8) =$	
$(10^9)(10^6) =$		$(10^{10})(10^{10}) =$	

Keystrokes for first entry: 1 0 x^y 5 × 1 0 x^y 4 =

The display of 1.0^9 is read "ten to the ninth power." Your entry should be 10^9 .

Complete the table.

For each example, look at the two exponents that were given and the exponent in your entry. You should see a pattern. **WITHOUT USING YOUR CALCULATOR**, write what you think the answer for the following problem would be: $(10^8)(10^4) = \underline{\hspace{2cm}}$

Describe the pattern in your own words.

Using your description, complete the following example by writing an exponent that is an expression containing a and b : $(10^a)(10^b) = 10^?$.

Do you think that the pattern you discovered holds only for powers of ten or for other numbers as well?

Before proceeding, set your calculator to the mode for normal calculation: MODE, 9.

Write your prediction using an exponent for each expression in the table below.

	Expression	Prediction	
	$(2^6)(2^4)$		
	$(3^9)(3^6)$		
	$(1.2^5)(1.2^2)$		
	$(-4^7)(-4^4)$		

Find the value of each expression; write the answers in the column at the left.

Find the value of your predictions; write the answers in the column at the right.

Compare the entries in the column at the left and the column at the right. The values for each expression and its prediction should be the same. If any are not, first check your predictions with those of another classmate. If your predictions are correct, next check your values for the expressions and the predictions.

Finally, complete the following general rule: $(x^a)(x^b) = x^?$.

This is known as the first law of exponents.