Evaluating Expressions

Math Concepts

- Variable
- Substitution
- Order of Operations
- Tables

Overview
Students will evaluate expressions using pencil and paper and then use the editing features of the home screen and/or the table feature of the TI-83 Plus to provide immediate positive reinforcement.

Materials

- TI-83 Plus

A variable is a letter that is used to represent one or more numbers.

A variable expression is a combination of numbers, variables, and operation symbols.

Evaluate the expression $P = 2l + 2w$ for the values of l and w given in the table. Write the expression showing the substitution then evaluate the expression.
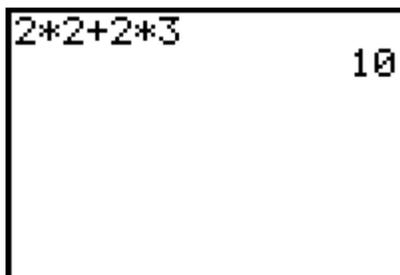
Teacher Notes

The TI-83 Plus helps students develop the skills needed to quickly and accurately evaluate variable expressions by providing immediate feedback.

l	w	2*l+2*w	P
2	3	2*2+2*3	10
3	4		
4	5		
5	6		
6	7		
7	8		

Use the TI-83 Plus to support answers. (Figure 1)


```
2*2+2*3
              10
```

Figure 1

CL 3481

Press 2nd ENTER to bring up the entry, then ◄ to edit the expression by moving the cursor over the value to be changed and type the new value. (Figure 2)
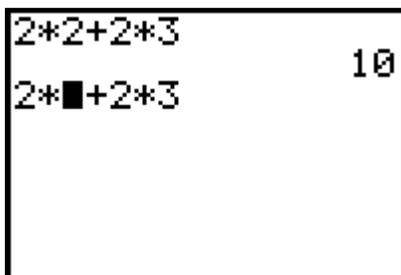

Figure 2

Evaluate the following:

First decide if the answer will be positive or negative.

Write the expanded form of the expression.

How do you know if the answer will be positive or negative? Write your prediction in the table. Write the expanded form of the problem. Find the value of the expression.

Problem	Positive or Negative	Expanded Form	Value
-2^2	-	-(2*2)	-4
$(-2)^2$	+	(-2)(-2)	4
-3^2			
$(-3)^2$			
-4^2			
$(-4)^2$			

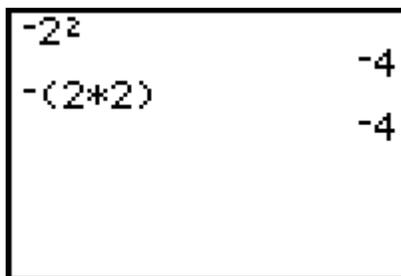Use the TI-83 Plus to support answers. (Figures 3 and 4)

Figure 3

- Many students make careless errors on paper when evaluating expressions involving negative numbers. Particularly when doing problems such as -2^2 and $(-2)^2$.

- A common error on the TI-83 Plus is using ⊟ when they should use ⊡. It is essential that students understand the difference in the operation of subtraction (⊟) and the opposite of ⊡.

- Make sure that students write out the expanded form of the expression. Have students support their answers by evaluating the original form and the expanded form on the TI-83 Plus. If the values do not agree then the expanded form is not correct.

- Stress to students that the parentheses are very important in evaluating the expressions on the TI-83 Plus. Have students verbalize the order of operations as they evaluate the expressions.

Figure 4

Evaluate $-b^2-4ac$ for the values in the table:

a	b	c	$-b^2-4ac$
1	-1	5	$-(-1)^2-4(1)(5)=-1-20=-21$
1	2	3	
-1	-2	2	
3	-4	1	
-4	-5	2	

Enter the expression on the TI-83 Plus just as it was written. Compare the results. (Figure 5)

Figure 5

Use the TI-83 Plus to evaluate the given expression for the values in the table. Write the expression just as it will be entered into the calculator and write the value to the nearest tenth. (Figure 6)

a	b	c	$(-b + \sqrt{(b^2 - 4ac)}) / (2a)$
-1	5	2	$(-5+\sqrt{(5^2-4*-1*2)}) / (2*-1) = -0.37$
1	-4	3	
-2	6	1	
-3	4	1	
2	-3	1	

Enter the expression on the TI-83 Plus just as it was written. **(Figure 6)**

```
( -5+√(5²-4* -1*2)
)/(2* -1)
        -.3722813233
■
```
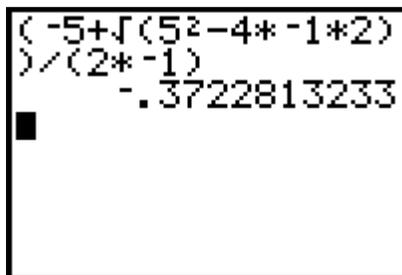
Figure 6

Given $f(x) = x^2 - 3x + 1$, find the value of the function for {-2, -1, 0, 1, 2} by using a table of values (Figure 7)
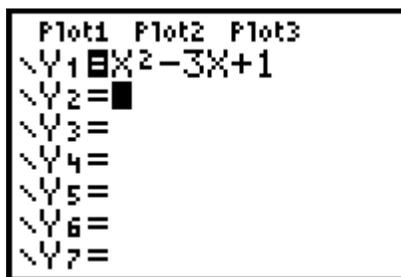
Enter the function in the y= editor.

```
Plot1  Plot2  Plot3
\Y1■X²-3X+1
\Y2=■
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

Figure 7

Press **2nd WINDOW** and change the table setup to **Ask** mode. (Figure 8)

```
TABLE SETUP
 TblStart=0
 ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

Figure 8

Press **2ND GRAPH**, enter each value in the x column, and press **ENTER**. (Figure 9)

```
 X    │ Y1  │
-2    │ 11  │
█████ │     │


X=
```
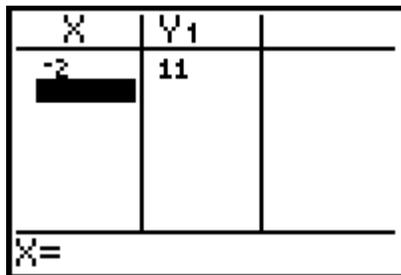
Figure 9

- Students may find the value of the function using home screen computation, a table of values, or the value function on a graph.

Given $f(x) = x^2 - 3x + 1$, find the value of the function for {-2, -1, 0, 1, 2} by graphing the function.

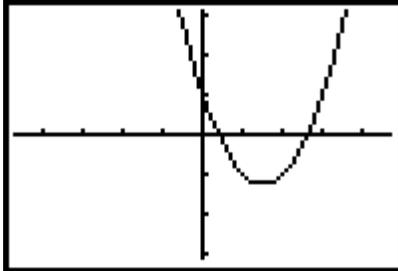Press **ZOOM 4** to set the Window to the decimal window and graph the function. (Figure 10)

Figure 10

To evaluate the function, press **TRACE**. Pressing **TRACE** brings up window with the cursor in the center of the screen. (Figure 11)
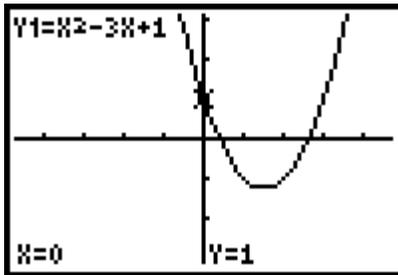
Figure 11

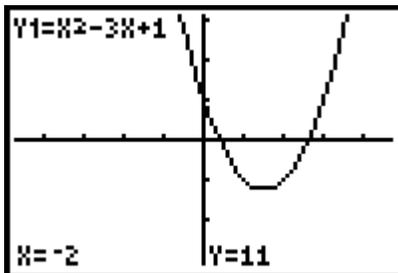Press **(-) 2 ENTER** to evaluate the function for x = -2. (Figure 12)

Figure 12