

# TI-83 Graphing Calculator Workshop

## Session I: Basic Functions

### 1. Adjusting the contrast

- Press **[ON]** to turn the calculator on.
- To increase the display contrast press **[2nd]**, then press and hold **[▲]** until display is desired darkness.
- To decrease the display contrast press **[2nd]**, then press and hold **[▼]**.
- If the display cannot be made dark enough, the batteries need to be replaced or recharged.
- To turn the calculator off, press **[2nd]** [OFF]. When you turn the calculator on the next time, everything will be as you left it. All data is preserved.

### 2. Changing batteries

- To change batteries without losing programs and stored data, turn calculator off.
- Place the cover on the calculator to avoid inadvertently turning on the calculator.
- Turn calculator over, push latch on battery cover down, and pull the cover out.
- Remove a single battery and replace it with a new one. Repeat for rest of batteries, one at a time. See the Guidebook for directions to change backup battery.
- Replace the cover.

### 3. Automatic shut down

- The calculator will automatically turn itself off after several minutes without any activity. This feature helps prolong the life of batteries. When you press **[ON]**, the calculator will be exactly as you left it.
- To get the most life out of the batteries, turn off the calculator as soon as you are finished with it.
- Always replace the cover when you are finished using the calculator.

### 4. Performing operations in the home screen.

- Press **[CLEAR]** to clear the home screen of previous calculations.
- Press **[CLEAR]** to clear the current calculation if you have not yet pressed **[ENTER]**.
- To delete a character before you have pressed **[ENTER]**, use arrow keys to place the blinking cursor on the character to be deleted; press **[DEL]**.
- To insert a character between two typed characters before you have pressed **[ENTER]**, use arrow keys to place the blinking cursor on the character immediately following the location of the new character; press **[2nd]** [INS]. You can type as many characters as you wish to insert in this location, however once you use any arrow key or press **[ENTER]** you will be out of the insert mode.
- The keys for the four arithmetic operations are located in the right-hand column above the **[ENTER]** key.

- Example:  $\frac{3}{4} - 5 \cdot 7 \div 11 + 9$
- Example: To enter  $2\frac{5}{8}$  type  $\boxed{2} \boxed{+} \boxed{5} \boxed{/} \boxed{8}$ . Parentheses are optional.
- The calculator performs operations using the Equations Operating System (EOS), which is similar to, but not identical to, the usual order of operations.

```

3/4-5*7/11+9
        6.568181818
2+5/8
                2.625
2+(5/8)
                2.625

```

#### 5. Changing a decimal answer to a fraction.

- To change the above answer to a fraction, press  $\boxed{\text{MATH}}$ , choose MATH 1:  $\blacktriangleright$ Frac, press  $\boxed{\text{ENTER}} \boxed{\text{ENTER}}$ .
- It is also possible to specify that the answer be given directly as a fraction.

```

3/4-5*7/11+9
        6.568181818
Ans $\blacktriangleright$ Frac
                289/44
3/4-5*7/11+9 $\blacktriangleright$ Fra
c
                289/44

```

#### 6. Changing a decimal answer to a mixed number.

- To change the above answer to a mixed number, first subtract the whole number 6. Then press  $\boxed{\text{MATH}}$ , choose MATH 1:  $\blacktriangleright$ Frac, press  $\boxed{\text{ENTER}} \boxed{\text{ENTER}}$  to change the decimal to a fraction.

The answer is  $6\frac{25}{44}$ .

```

3/4-5*7/11+9
        6.568181818
Ans-6
        .5681818182
Ans $\blacktriangleright$ Frac
                25/44

```

#### 7. Using the negative sign

- The  $\boxed{(-)}$  is only used in front of a number or an expression to change its sign. It cannot be used for subtraction.
- The product  $(-4)(-3)$  can be found by using parentheses or the multiplication sign. It is not necessary to use both, although it will not hurt.

```

(-4)*(-3)
                12
(-4)(-3)
                12
-4*-3
                12

```

#### 8. Storing a value as a variable

- To assign the value -6 to the variable X, press  $\boxed{(-)} \boxed{6} \boxed{\text{STO}\blacktriangleright} \boxed{\text{X,T,}\theta} \boxed{\text{ENTER}}$ .
- The value assigned to X will change only if you store some other value for X or perform an operation which calculates a new value for x.
- To assign the value 7 to the variable A, press  $\boxed{7} \boxed{\text{STO}\blacktriangleright} \boxed{\text{ALPHA}} \boxed{\text{A}} \boxed{\text{ENTER}}$ .
- Values stored in variables will stay the same until you change them.
- Multiplication is understood in an expression such as 4X or XA.
- Whenever you perform an operation on a graph (such as intersect or maximum), the values calculated will automatically be stored as X and Y.

```

-6 $\blacktriangleright$ X
                -6
X
                -6
2X+5
                -7

```

## 9. Automatic parentheses

- The TI-83 automatically inserts the first parenthesis for many of the operations which frequently require parentheses.
- These operations include square root, absolute value, logarithms, trigonometry functions, rounding, and many of the functions on the **MATH** key.
- It is not always necessary to close the parentheses, but it is a good practice because it cuts down on errors.
- To find  $|-3 - 6| + 4$ , press **MATH** [NUM] [1 : abs ( ) (-) 3 - 6 ) + 4 **ENTER**.

```
abs(-3-6)+4
13
```

## 10. Using parentheses for implied grouping

- The calculator is sometimes “blind”; it does not see certain implied groupings that we see.
- Example:  $\frac{7x}{8-x}$ . The calculator will not know that the entire denominator is  $8 - x$  unless you tell it so. EOS does multiplication before subtraction, so it is not necessary to put the numerator in parentheses. However, it will not hurt anything and it is a good practice whenever you are unsure whether parentheses are needed or not. Remember that  $x$  still has the value of  $-6$  which we stored previously.
- The TI-83 will interpret  $\frac{2}{3}x$  correctly without parentheses. However, placing parentheses around the fraction will not change the result. Notice the difference when the parentheses are placed around the  $(3x)$ .

```
7X/(8-X)
-3
(7X)/(8-X)
-3
```

```
2/3X
-4
(2/3)X
-4
2/(3X)
-.1111111111
```

## 11. Finding powers and roots

- Since squares are used so frequently, there is a special key for squaring a number. To find  $24^2$ , press **2** **4** **x<sup>2</sup>** **ENTER**.
- Example:  $-6^2$  will equal  $-36$  on the calculator because the calculator is squaring  $6$  first and then multiplying by  $-1$ . (This is proper order of operations!) However,  $(-6)^2$  will equal  $36$ . Note that  $(-6)^2$  yields  $36$  because the calculator is (correctly) finding  $(-6)(-6) = 36$ .
- You will need to insert parentheses to find  $\sqrt{5^2 - 2^2}x$ : **2nd** **√(** **5** **x<sup>2</sup>** **-** **2** **x<sup>2</sup>** **)** **x** **ENTER**. The calculator needs to know where the square root ends. The calculator cannot change this answer to a fraction because it is not a rational number.

```
-6^2
-36
(-6)^2
36
```

```
√(5^2-2^2)X
7
√(5^2-2^2)X
-27.49545417
Ans>Frac
-27.49545417
```

- On the **MATH** key there are options to find the cube of a number, the cube root of a number, and any positive root of a number.
- The **△** key can be also be used to find any power.
- To find a root, first rewrite the root as a fractional power:

$$\frac{1}{\sqrt[3]{8}} = 8^{-\frac{1}{3}}$$

Notice the difference if you forget the parentheses around the exponent!

- The calculator handles complicated exponents easily.
- A shortcut for finding the reciprocal of a number, such as  $5^{-1}$ , is to press **5** **x<sup>-1</sup>** **ENTER**.

$(-2)^5$	-32
$8^{(-1/3)}$	.5
$8^{-1/3}$	.0416666667

$4^{(-5/2)}$ <b>Frac</b>	$1/32$
$5^{-1}$ <b>Frac</b>	$1/5$

## 12. Using the answer from one calculation in another calculation

- If you press any of the operation keys  $+$ ,  $-$ ,  $\times$ ,  $\div$ ,  $x^{-1}$ ,  $x^2$ , or  $\wedge$  immediately after pressing **ENTER** to perform a calculation, the calculator will recall the answer from the previous calculation and use it as the first number in the next calculation.
- If you wish to use the answer from the previous calculation as part of another calculation, you can recall the previous answer by pressing **2nd** **[ANS]**.

$5 \times 10$	-20
$\text{Ans} \times 10$	-200
$8000 \div (4 \text{Ans})$	-10

## 13. Recalling a previous entry

- A previous entry can be recalled so that it can be repeated or edited by pressing **2nd** **[ENTRY]**. This process can be repeated several times, depending upon the length of the entry. It is not necessary to clear one calculation before recalling another.
- To execute a calculation that has been recalled, press **ENTER**.
- An entry that has been recalled is automatically in edit mode. This enables you to correct a mistake or to change some of the numbers. After the corrections have been made, press **ENTER** to evaluate.