

# Chapter 0

## Getting Started on the TI-82 or TI-83<sup>1</sup>

### 0.1 Turn the Calculator ON / OFF

#### Locating the keys.

Turn your calculator on by using the **ON** key, located in the lower left-hand corner of the calculator. To turn the calculator off press **2nd** **OFF** : located above the **ON** key.

To locate the correct keys think of your calculator as being divided into three sections:

1. The bottom six rows of keys are your mathematical calculation and function keys.
2. Rows 7 - 9 are the menu and editing keys.
3. The very top row (under the screen) is where your graphing keys are located.

### 0.2 Adjusting the Screen Contrast

Depending on the room lighting you may want to adjust the screen contrast.

1. To darken the screen:

Press and release the **2nd** key, then press.

and hold the up arrow **Δ** key.

2. To lighten the screen:

Press and release the **2nd** key, then press and hold down arrow **∇** key.

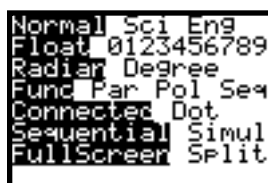
As the display contrast changes, a number appears in the upper right corner of the screen between 0 (lightest) and 9 (darkest).

If you adjust the setting to 0, the display may become completely blank. If this happens, increase the contrast and the display will reappear. When contrast needs to be set at 8 or 9 all the time, it is probably time to change the batteries.

### 0.3 MODE Default Settings

The calculator should be set to the default mode settings. Press **MODE** to see the settings.

Set your calculator to the settings in Figure 0.1 or 0.2 using your arrow keys and pressing **ENTER** to activate your choice.



Normal Sci Eng  
Float 0123456789  
Radian Degree  
Func Par Pol Seq  
Connected Dot  
Sequential Simul  
Full Screen Split

Figure 0.1  
The TI-82 default mode screen.



Normal Sci Eng  
Float 0123456789  
Radian Degree  
Func Par Pol Seq  
Connected Dot  
Sequential Simul  
Real a+bi re^θi  
Full Horiz G-T

Figure 0.2  
The TI-83 default mode screen.

**Note:** If your calculator is not new you may want to RESET MEMORY. This will completely erase all data and programs and reset the calculator to the default mode. Use this cautiously.

Press **2nd** **MEM** (above +), select 3 then select **[2:Reset]**.

<sup>1</sup> The key stroking and menus for the TI-82 and TI-83 are nearly the same. Where they differ, screen images are presented side by side.

## 0.4 The Home Screen

The Home Screen is your calculation and execution of instruction screen. To return to the Home Screen from any other screen, press **2nd** **QUIT**. The Home Screen is the primary screen of the TI-82 or TI-83. If there is something displayed on the Home Screen, press the **CLEAR** key.

## 0.5 Calculating

The bottom six rows of keys on the graphing calculator behave like those on any scientific calculator, except that your entry is seen on an eight line computer screen. When you want the calculator to perform any calculation or instruction, press **ENTER**.

**Note:** The **2nd** key will access the commands to the above left of any key, which are color coded with **2nd** key.

### Example 1

From the Home screen, do the following:

1. Type 12 **X** 2 then press **ENTER**; 24 is now displayed and *stored* as the answer. See Figure 0.3.
2. Press **2nd** **ANS** and **ENTER**; 24 is again displayed.

**Note:** The result of your last calculation is always stored in memory. To recall your last calculation press **2nd** **ANS**.

3. Press the multiplication key **X**, then 2 and then **ENTER**. Pressing any operation key, +, -, **X**,  $\div$ ,  $x^2$ ,  $x^{-1}$  etc., assumes that you want to operate on the stored answer (see Fig. 0.3).

## 0.6 Iteration, Recalling a Process

Notice how **ANS** is also used.

Repeatedly press **ENTER**. Your screen should look like the bottom of Figures 0.3 and 0.4.

This process is called iteration (repeating some process over and over again). The last operation (multiplying by 2) is repeated on the new answer.

```
12*2      24
Ans       24
Ans*2     48
          96
```

Figure 0.3

The asterisk, \*, is used for multiplication in place of the "times" sign to avoid confusion with the letter *x*.

```
Ans*2     48
          96
          192
          384
          768
          1536
```

Figure 0.4

### Example 2

Interest compounded at 5% annually on an initial investment of \$1000 can be represented by  $1000 \cdot 1.05$ , or  $A = P(1 + R)$  for the first year .

[Amount = original investment(1 + rate).]

Use iteration to determine the number of years for the amount of accumulated investment to be greater than \$1300.

Press **CLEAR** to clear the Home Screen.

Type 1000 followed by **ENTER** .

The number 1000 is now stored in memory.

Press **X** 1.05 **ENTER** . The number 1050 will

now be displayed. By repeatedly pressing

**ENTER** , you can see the growth of your initial \$1000 investment year by year and determine that 6 iterations (years) are necessary for you to exceed \$1300. See Figures 0.5 and 0.6.

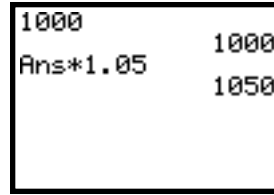


Figure 0.5

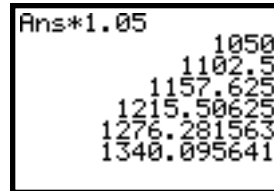


Figure 0.6

Between year 5 and 6  
the amount is > 1300.

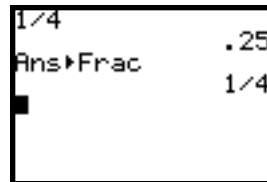


Figure 0.7

## 0.7 Converting Decimals and Fractions

The TI-82 or TI-83 can be used to convert decimals and fractions.

Press 1 **÷** 4 **ENTER** (see Fig. 0.7).

The decimal answer for this expression, 0.25, is displayed. Press **MATH** . You are in the MATH menu . Menus give a list of additional command options (see Fig. 0.8 or 0.9). Press **1** or **ENTER** to select the highlighted option. This option [1: Frac] will change the decimal answer back into a fraction.

**Note:** When the denominator of a fraction has more than four digits the answer is displayed as a decimal and will not return to a fraction.

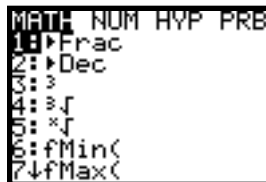


Figure 0.8

The TI-82 MATH menu

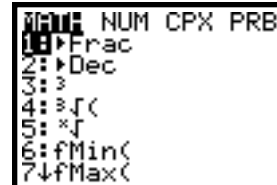


Figure 0.9

The TI-83 MATH menu

## 0.8 Selecting Items from a Menu.

You can select an item from a menu by typing the number or by moving to that menu option with the down arrow key  $\nabla$ .

You press  $\boxed{\text{ENTER}}$  to select your menu option. Press  $\boxed{\text{MATH}} \nabla$  select [2: Dec]. Press  $\boxed{\text{ENTER}}$ , this changes the fraction back to a decimal (see Fig. 0.10).

### Example 3

Type in the following fraction problems, then use the MATH menu to change the answers back to fractional form.

1.  $\frac{1}{2} + \frac{1}{3}$

Press  $(1 \boxed{+} 2) \boxed{+} (1 \boxed{+} 3) \boxed{\text{ENTER}}$ .

Press  $\boxed{\text{MATH}} \boxed{1} \boxed{\text{ENTER}}$ .

2.  $3\frac{5}{9} + 5\frac{3}{7}$

Press  $(\boxed{(} \boxed{3} \boxed{+} \boxed{5} \boxed{\div} \boxed{9} \boxed{)} \boxed{+} (\boxed{(} \boxed{5} \boxed{+} \boxed{3} \boxed{\div} \boxed{7} \boxed{)})$

$\boxed{\text{ENTER}}$ . Press  $\boxed{\text{MATH}} \boxed{1} \boxed{\text{ENTER}}$

(see Fig. 0.11).

The answer to Example 3 part 2 is  $566/63$ .

Press  $\boxed{\text{CLEAR}}$ .

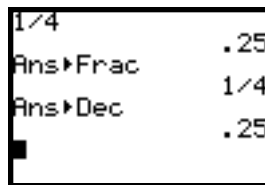


Figure 0.10

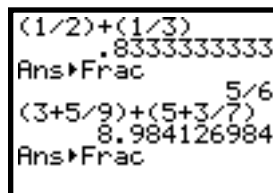


Figure 0.11

## 0.9 Raising a Number to a Power

The calculator can be used to raise a number (called the base) to a power by using the exponent key,  $\wedge$ .

For  $3^2$  press  $3 \wedge 2 \boxed{\text{ENTER}}$  or use a short cut

press  $3 \boxed{x^2} \boxed{\text{ENTER}}$ . This last method pastes the exponent to the right of 3 (see Fig. 0.12).

### Example 4

Type the expression:

$$3^4 \times 2^5 \div 6^2$$

Press  $\boxed{\text{ENTER}}$  for the result (see Fig. 0.12).

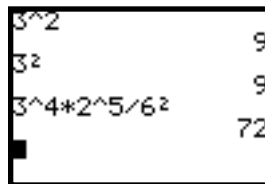


Figure 0.12

## 0.10 Order of Operations

The TI-82 or TI-83 uses an algebraic order of operations: inside parentheses first, powers next, then multiply or divide from left to right and lastly add or subtract from left to right.

**Example 5**

1. Enter:  $1 + 2(4 - 2)^2 + 6 \div 2$

(see Figure 13).

The order of operations are performed algebraically in the following steps:

- $1 + 2(4 - 2)^2 + 6 \div 2 =$
- $1 + 2(2)^2 + 6 \div 2 =$       inside parentheses
- $1 + 2(4) + 6 \div 2 =$       raise to power
- $1 + 8 + 6 \div 2 =$       multiply
- $1 + 8 + 3 =$       divide
- $9 + 3 =$       add
- 12**      add

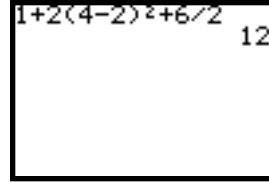


Figure 0.13

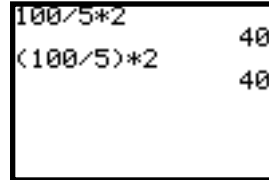


Figure 0.14

2. Enter: "One hundred fifths times two."

See Figure 0.14 for two methods.

**Troubleshooting:** For the TI-82 users, compare the difference in order of operations in Figures 0.14 and 0.15. Parenthesis in the denominator of a fraction are interpreted as a grouping. For the TI-83 parentheses are interpreted the same as the multiplication sign (see Fig. 0.16). To avoid confusion always enclose fractions in parentheses.

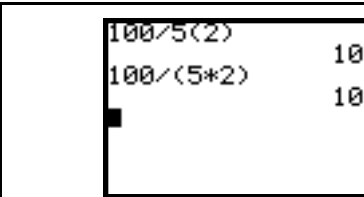


Figure 0.15

TI-82 Order of Operations

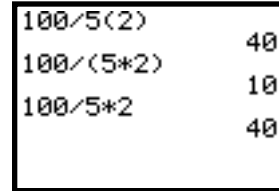


Figure 0.16

TI-83 Order of Operations

3. Enter "Sixteen raised to the one half power."

This is the same as "the square root of 16."

**Note:**  $16^{1/2}$  is *not*  $\sqrt{16}$ ; fractional exponents must always be enclosed in parentheses (see Fig. 0.17).

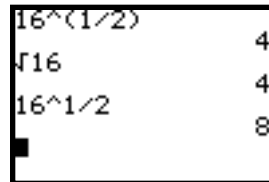


Figure 0.17

**0.11 Truth Tests**

The graphing calculator can be used to determine whether an expression is true or false.

To use this feature, you must use the 2nd

TEST menu. Figure 0.18 shows the TEST menu. This is where the equal and inequality symbols are located.

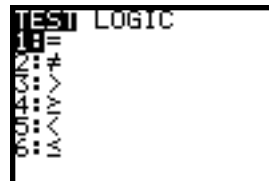


Figure 0.18

### Example 6

#### 1. Is $3 < 7$ true or false?

Press 3 **2nd** **TEST** **▽** .

Select [ 5:< . ], press 7 **ENTER** (see Fig. 0.19).

**Note:** When performing a TEST, remember that 1 means TRUE and 0 means FALSE.

#### 2. Is $3(4 + 5) = (3 \times 4) + 5$ true or false?

This is a false statement, thus the answer is zero (see Fig. 0.19) because:

$$3(4 + 5) = (3 \times 4) + (3 \times 5)$$

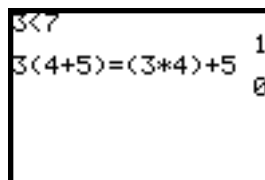


Figure 0.19

## 0.12 Deep Recall and Editing

Press **CLEAR** . To recover your last entry

press **2nd** **ENTRY** . To evaluate press

**ENTER** . To edit an expression, use the left and right arrows to position the cursor for editing and press delete **DEL** or insert **2nd**

**INS** .

### Example 7

Change the expression in Example 6 part 2

to:  $3(4 + 5) = (3 \times 4) + (3 \times 5)$ .

First recall the expression, **2nd** **ENTRY** .

Use **◀** to place the cursor on the 5; press **2nd**

**INS** type **(** **3** **X** **)** . Then **▶** to place the

parentheses after the 5, **ENTER** (see Fig.

0.20). Now the expression is evaluated as true (i.e. the number 1).

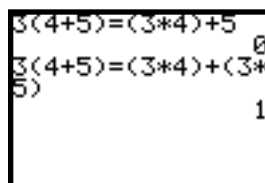


Figure 0.20

**Note:** Also try pressing **2nd** **ENTRY** several times and you will see some of the old expressions you typed. This is called *deep recall* and it is used to retrieve expressions that have been typed many steps earlier.

### 0.13 Storing Values to Variables

Recall Example 2 where we were finding the amount of money accumulated after one year ( $A$ ) using the formula  $A = P(1 + R)^x$ , where the principle  $P = \$1000$  and the rate  $R = 5\%$ , and  $x=1$ . The calculator allows you to store values to alphabetical letters A through Z. You access the letters by first pressing the **ALPHA** key and you store number values to letters by using the store **STO** key.

Note: Alphabetical letters are located to the above right of keys and are color coded to match the **ALPHA** key.

#### Example 8

Find  $A$  if  $P = 1000$ ,  $R = .05$  and  $x=1$  using  $A = P(1 + R)^1 = P(1 + R)$ .

- To store 1000 to  $P$ , press 1000 **STO** **ALPHA** **P** **ENTER**.
- To store .05 to  $R$ , press .05 **STO** **ALPHA** **R** **ENTER** (see Fig. 0. 21).
- Type the expression  $P(1 + R)$ ; remember to press **ALPHA** before typing the letter, and press **ENTER**.

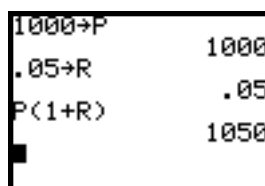
The expression has been evaluated using the stored values to  $P$  and  $R$ . These values will remain the same until you store a new value to  $R$  and  $P$  (see Fig. 0. 21).

**Trouble Shooting:** If your calculator is new or if the memory has been cleared, the initial stored value to all letters is zero.

#### 0.13.1 A special note about $x$ and $y$

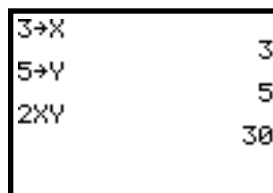
Since the variables  $x$  and  $y$  are used in plotting graphs, their values are constantly updated when you TRACE on a graph.

There are two ways to access the  $x$  variable since it is usually the variable of choice in algebra. Press **ALPHA** **X** or use the handy **X T  $\Theta$**  key (see Fig. 0.22).



1000→P	1000
.05→R	.05
P(1+R)	1050

Figure 0.21



3→X	3
5→Y	5
2XY	30

Figure 0.22

## 0.14 Subtraction and “Negative of”

In algebra the minus sign is used two different ways:

1. as the operation sign between two numbers to mean “subtract”, as in  $5 - 3$  or,
2. in front of a number to mean “the opposite of or negative of”, as in  $-7$ .

The calculator has two different keys for minus. Press  $5$   $\boxed{-}$   $3$   $\boxed{\text{ENTER}}$  for subtraction.

For  $-7$  find the negative key  $\boxed{(-)}$  located to the left of ENTER. Press  $\boxed{(-)}$   $7$   $\boxed{\text{ENTER}}$  (see Fig. 0.23).

**Note:** The negative sign is actually a little bit shorter and slightly raised compared to the subtraction symbol.

### Example 9

Type the following problems:

1.  $6 - -12$
2.  $-3 \times -9$
3.  $(-5)^2$
4.  $-5^2$

(see Figs. 0.23 and 0.24).

Note that the values for example 9 parts 3 and 4 above are different (see Fig. 0.24.)

Order of operations in part 4 says: “Square five then take its opposite.”

**Note:** To square a negative number you must put it in parentheses.

**Trouble Shooting:** The most common calculator error is using the subtraction symbol instead of the negative symbol (see Fig. 0.25 and 0.26).

## 0.15 The Error Message

Using the subtraction sign incorrectly produces an error message. When you type the expression as in Fig. 0.25 and press

$\boxed{\text{ENTER}}$  ERR:SYNTAX appears (see Fig. 0.26).

Choose [2:Goto] to position the cursor to the place where the error occurred. Choose [1:Quit] to begin a new line on the Home Screen (see Fig. 0.26).

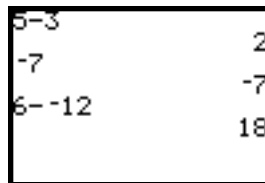


Figure 0.23

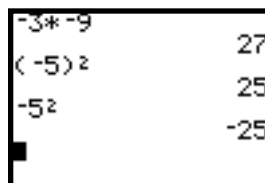


Figure 0.24

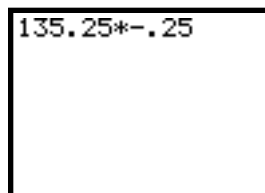


Figure 0.25



Figure 0.26