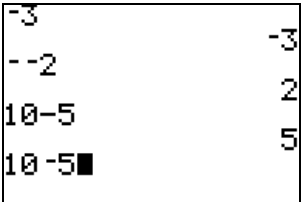
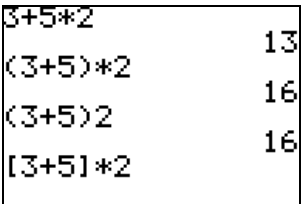
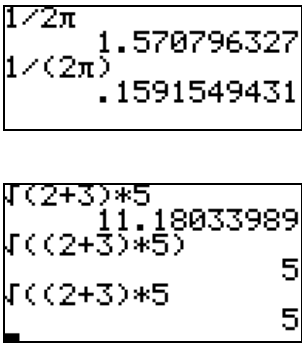
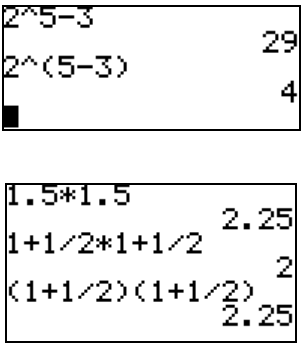
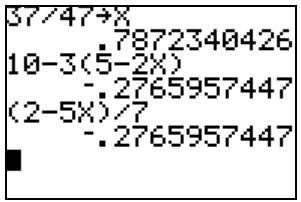


## Arithmetic on the TI 83/84

Your calculator is incredibly powerful and relatively easy to use. This activity will touch on a small part of its capabilities.

<p>◆ There are two keys that look very much alike, but they are very different. They are the subtraction key <math>\square</math> and the negative (minus) key <math>\ominus</math>. You can think of the negative key as multiplying by negative one or changing the sign of the following number. Note the subtle difference these calculations.</p> <p>Note: The last command (10-5) will generate an error message. Can you see why the calculator is having difficulty deciphering the command?</p>			
<p>◆ Parentheses are very important grouping symbols. Although the TI contains both [ ] and { }, only rounded parentheses can be used for arithmetic. Parentheses are used to control order of operations.</p> <p>Note: when an operation is omitted, as in (3+5)2, multiplication is assumed.</p>			
<p>◆ <i>calculation</i>, <i>calculation</i>, <math>\sqrt{\text{calculation}}</math>, <i>calculation</i><sup><i>calculation</i></sup>, and calculations with mixed numbers are often written without parentheses but must be entered into the TI <u>with</u> parentheses. See if you can determine the correct TI version for each of these:</p>			
<p><math>\frac{1}{2\pi}</math></p> <p><math>\sqrt{(2+3)*5}</math></p>		<p><math>2^{5-3}</math></p> <p><math>1\frac{1}{2} \times 1\frac{1}{2}</math></p>	
<p>◆ Suppose you just 'solved' the equation <math>10 - 3(5 - 2x) = \frac{2 - 5x}{7}</math> and found <math>x = 37/47</math>. Now it's time to check the answer. Begin by storing 37/47 in the 'X' memory slot. 37/47 <math>\text{STO} \blacktriangleright</math> <math>\text{X,T,}\theta,n</math> Type the left-hand side (LHS) and Enter, then the right-hand side (RHS) and Enter. Since LHS = RHS, this value of 'X' is a valid solution to the equation.</p>			

- Calculating  $\sqrt{K}$ . To evaluate this expression, I need to give the calculator a value for K. Let K = 5. To put 5 into the "memory slot" named K, hit the following keys.

[5] [STO→] [Alpha] [K] [Enter]

(The alpha key is green on the 83 and the 84)

Now all you need to do is type in [2<sup>nd</sup>] [ $\sqrt{\quad}$ ] [Alpha] [K] [Enter]

Note: The calculator automatically inserts the left parenthesis when using the [ $\sqrt{\quad}$ ] key. You must remember to close the parenthesis.

```
5→K          5
√(K)        2.236067977
█
```

- Be sure you know how your calculator will handle certain operations.

For example evaluate  $\rightarrow \frac{3}{2K}$ . It is a good idea to use parenthesis to group numerators and denominators. The correct answer here is 0.3, not 7.5 .

```
5→K          5
3/2K         7.5
3/(2K)      .3
█
```

- We will often raise numbers and expressions to powers. To do this we will use the exponent key  $\wedge$ .

Consider  $3 * K^4$ . This would be typed in as  $3 * K^4$ . Note the difference in keystrokes to evaluate  $(3K)^4$ .

Try them both.

```
(3K)^4      50625
3K^4        1875
█
```

- There are two exponents we use so much they have their own keys. The square button [ $x^2$ ] and the inverse or negative one exponent

[ $x^{-1}$ ]

Try  $K^2$  and  $K^{-1}$ .

```
K^2         25
K^-1        .2
█
```

- Often numbers get extremely large or extremely small. In that case it is often necessary to use Scientific Notation. To use the scientific notation button the TI user must hit the [2<sup>nd</sup>] key, then the [EE] key. The [2<sup>nd</sup>] is yellow on the 83 and blue on the 84. To input  $3.63 * 10^5$ , we use the keystrokes [3.63] [2<sup>nd</sup>] [EE] [5] [Enter]. Often a number gets so big or small our calculator automatically puts it in scientific notation as below:

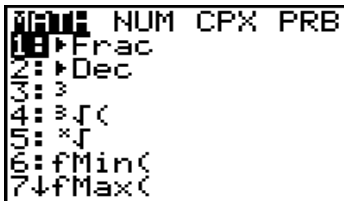
```
3.63E5      363000
5869^10
4.848876191E37
35/(25^6)
█          1.4336E-7
```

Note the difference between raising a number to the tenth

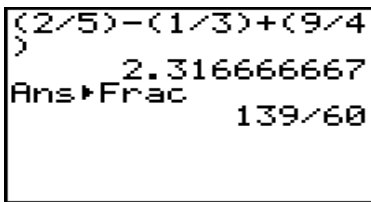
The E on the calculator means "times 10 to the -7. In other words the number is

- It is important to remember that the notation that the TI calculator uses is unique to TI. It is NOT acceptable math notation. So the last two results in the screen above should be re-written as  $4.85 \times 10^{37}$  and  $1.43 \times 10^{-7}$ .

- Your calculator can handle fractions as well. To convert a decimal to a fraction you need to get into the "Math menu". This is done by pushing the [Math] key. Once inside the "Math menu" you will notice several more choices.



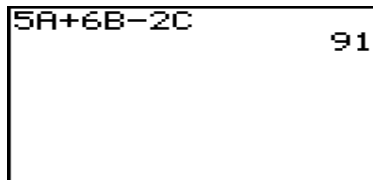
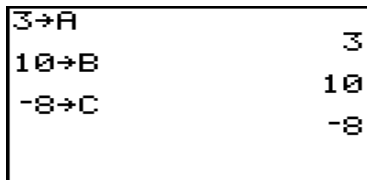
Choice "1: " is the one we are interested in at the moment. By choosing "1: " the calculator will convert the last output into a fraction (if possible)



Once the calculator calculated the 2.316666667, I then used the following keystrokes: [Math] [ 1 ] [Enter]

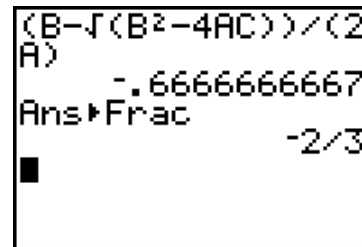
- We can store values into a variety of "memory" locations on your calculator. In essence every letter serves as a memory position. For example, let  $A = 3$ ,  $B = 10$  and  $C = -8$ . Then with those values stored in the calculator we can evaluate  $5A + 6B - 2C$ .

To store 3 "into" A, type 3, then hit the [STO] button, then [ALPHA], then A. Likewise for the other letters.



With the same values for A, B, and C evaluate  $\frac{B - \sqrt{B^2 - 4AC}}{2A}$

Note all the parenthesis: Around the numerator, denominator, and the radicand. Also, note I changed the answer to a fraction.



Also, if you ever need to edit a long expression, simply hit [2<sup>nd</sup>] [ENTER] and the calculator will scroll through the last entries as you type in [2<sup>nd</sup>] [ENTER]. Stop at the one you want and re-evaluate it or edit it.

## Arithmetic on the TI 83/84

Your calculator is incredibly powerful and relatively easy to use. This activity will touch on a small part of its capabilities.

1. Perform the following calculations on your calculator. Give rational answers for a - e.

a)  $-4 - 8 =$

b)  $8\{3 - 2[3 - 2(5 + 2)]\} =$

c)  $-4 - -5 =$

d)  $\frac{-3^2 + (-5)^2 - 2^3}{3^{3-2}} =$

e)  $\frac{45 - 13}{2(31 - 6) + 12} =$

f)  $\frac{5}{2\pi} + 2^{2\pi} \approx$

2. Evaluate  $\frac{23 - 15}{4^3}$  by hand and then on the calculator. **Be absolutely certain you have the correct value for R before you move on.** Store that value in 'R'. Display as a fraction on the screen. What is  $R^{-5}$ ?

3. Evaluate  $1 + 2R \div (4R)$  and then evaluate  $(1 + 2R) \div (4R)$ . Are they the same? Explain why or why not? Which of the expressions in (3) is the same as  $\frac{1 + 2R}{4R}$ ?

4. Do the following operations and then rewrite your answer as a fraction.

$$\frac{45}{2} + \frac{17 - 23}{5} - \frac{13 + 18}{9 - 5} + \frac{-3 - 12}{-3 + 6} + 5 =$$

5. Do the following operations and then rewrite your answer as a fraction.

$$\left(\frac{3}{7}\right)^2 + \left(\frac{49}{5}\right)^{-1} =$$

6. Evaluate the following. Write your result in fraction form if possible. Do not round your answer before hitting the fraction key!

a)  $\frac{5 + 16 * 3^2}{37 - 2 * 7}$

b)  $\sqrt{\frac{16 + 3 * 35}{235 - 3 * 13}}$

c)  $\sqrt{400 - 5 * 4^2}$

d)  $\left(\frac{5 - 12^2}{37 + 4 * 9}\right)^3$

7. Store the following values into your calculator:  $A = 4$ ,  $B = 5$ ,  $C = -6$  and then evaluate the following:

a)  $12B + 6C^2 - 12A$

b)  $\frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$  (Pay close attention to Order of Operations!)

8. Evaluate the following and write your answers as fractions.

a)  $\left(\frac{2}{5}\right)^2$

b)  $\left(\frac{2}{5}\right)^{-2}$

c)  $\left(\frac{3}{8}\right)^3$

d)  $\left(\frac{3}{8}\right)^{-3}$

e) By comparing parts (a) and (b) and then parts (c) and (d), determine what the negative exponent does.

9. Use your calculator to evaluate: Write your answer in correct scientific notation.

c)  $5678 \times 34,000,000,000,000,000 =$

b)  $\frac{9 \times 10^{-14}}{4 \times 10^{-15}} =$

c)  $(345)^4(807)^{12} =$

d)  $\frac{408}{2589^9} =$

10. One light-year is the distance that light travels in one year (365 days). The speed of light is about 186,000 miles per second. Express your answer in scientific notation.

- In miles, how long is one light year?
- The circumference of Earth is roughly 25,000 miles. Assuming light would curve around the Earth, how long would it take light to travel all the way around the Earth?

## Arithmetic on the TI 83/84

Your calculator is incredibly powerful and relatively easy to use. This activity will touch on a small part of its capabilities.

1. Perform the following calculations on your calculator. Give rational answers for a - e.

a)  $-4 - 8 = -12$                       b)  $8\{3 - 2[3 - 2(5 + 2)]\} = 200$       c)  $-4 - -5 = 1$

d)  $\frac{-3^2 + (-5)^2 - 2^3}{3^{3-2}} = 8/3$                       e)  $\frac{45 - 13}{2(31 - 6) + 12} = 16/31$                       f)  $\frac{5}{2\pi} + 2^{2\pi} \approx 78.676$

2. Evaluate  $\frac{23 - 15}{4^3}$  ( $R = 1/8$ ) by hand and then on the calculator. **Be absolutely certain you have the correct value for R before you move on.** Store that value in 'R'. Display as a fraction on the screen. What is  $R^{-5}$ ? **32768**

3. Evaluate (a)  $1 + 2R \div (4R)$  ( $3/2$ ) and then evaluate (b)  $(1 + 2R) \div (4R)$  ( $5/2$ ). Are they the same? **No** Explain why or why not? Which of the expressions in (3) is the same as  $\frac{1 + 2R}{4R}$ ?

(a)  $1 + 2R \div (4R) = 1 + \frac{2R}{4R}$                       (b)  $(1 + 2R) \div (4R) = \frac{1 + 2R}{4R}$

4. Do the following operations and then rewrite your answer as a fraction.

$$\frac{45}{2} + \frac{17 - 23}{5} - \frac{13 + 18}{9 - 5} + \frac{-3 - 12}{-3 + 6} + 5 = 271/20$$

5. Do the following operations and then rewrite your answer as a fraction.

$$\left(\frac{3}{7}\right)^2 + \left(\frac{49}{5}\right)^{-1} = 2/7$$

6. Evaluate the following. Write your result in fraction form if possible. Do not round your answer before hitting the fraction key!

a)  $\frac{5 + 16 * 3^2}{37 - 2 * 7} = 149/23 = 6 \frac{11}{23}$

b)  $\sqrt{\frac{16 + 3 * 35}{235 - 3 * 13}} = 11/14$

c)  $\sqrt{400 - 5 * 4^2} = \sqrt{320} \approx 17.89$

d)  $\left(\frac{5 - 12^2}{37 + 4 * 9}\right)^3 = -2685619/389017 \approx -6.90$

7. Store the following values into your calculator:  $A = 4$ ,  $B = 5$ ,  $C = -6$  and then evaluate the following:

a)  $12B + 6C^2 - 12A$  (**228**)                      b)  $\frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$  (Pay attention to Order of Operations!)

$b_1 = 3/4, b_2 = -2$

8. Evaluate the following and write your answers as fractions.

a)  $\left(\frac{2}{5}\right)^2 = 4/25$       b)  $\left(\frac{2}{5}\right)^{-2} = 25/4$       c)  $\left(\frac{3}{8}\right)^3 = 27/512$       d)  $\left(\frac{3}{8}\right)^{-3} = 512/27$

e) By comparing parts (a) and (b) and then parts (c) and (d), determine what the negative exponent does.

$$(a/b)^{-n} = (b/a)^n$$

9. Use your calculator to evaluate: Write your answer in correct scientific notation.

c)  $5678 \times 34,000,000,000,000,000 =$       b)  $\frac{9 \times 10^{-14}}{4 \times 10^{-15}} = 2.25 \times 10$

You get an incorrect answer if you enter the 2<sup>nd</sup> number with all zero. You get a correct answer by entering the second number as  $34 \times 10^{18}$ . Correct answer:  $1.93052 \times 10^{23}$

c)  $(345)^4(807)^{12} \approx 1.08 \times 10^{45}$       d)  $\frac{408}{2589^9} \approx 7.81 \times 10^{-29}$

10. One light-year is the distance that light travels in one year (365 days). The speed of light is about 186,000 miles per second. Express your answer in scientific notation.

- In miles, how long is one light year?  $5.87 \times 10^{12}$  mi
- The circumference of Earth is roughly 25,000 miles. Assuming light would curve around the Earth, how long would it take light to travel all the way around the Earth?  
 $1.34 \times 10^{-1}$  sec