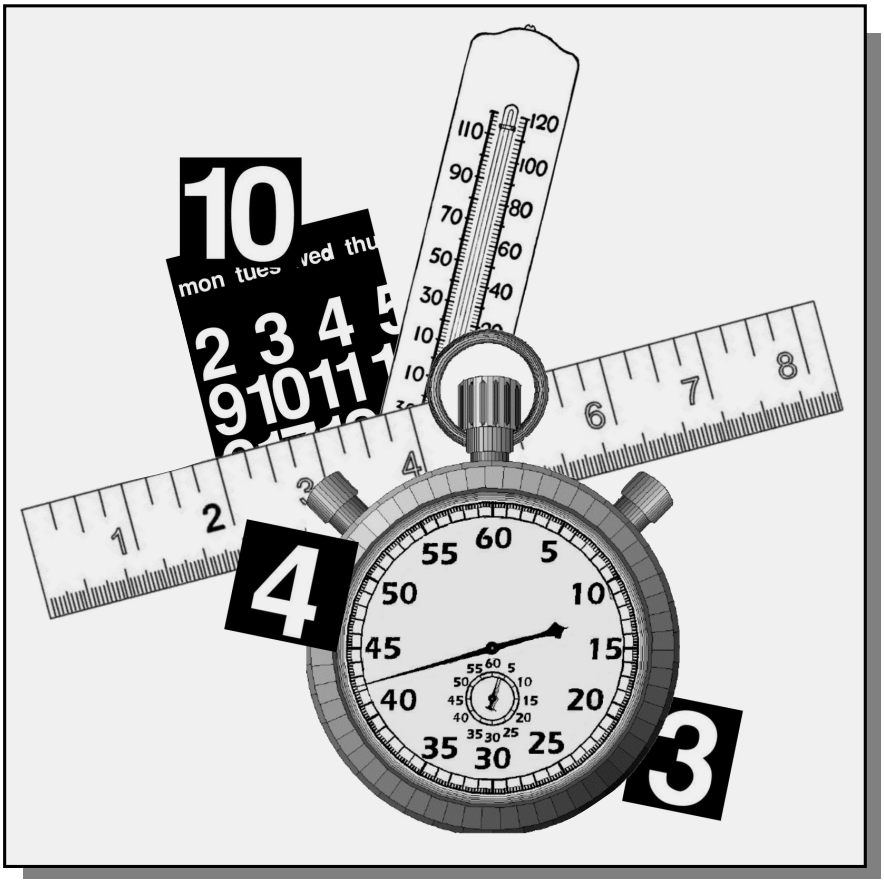
Basic Math Skills



Chapter 6

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Basic Math Skills

Chapter 6

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"The study of Mathematics cannot be replaced by any other activity that will train and develop man's purely logical faculties to the same level of rationality."

—C. O. Oakley



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Basic Math Skills



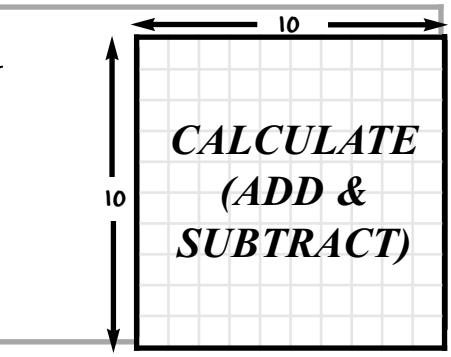
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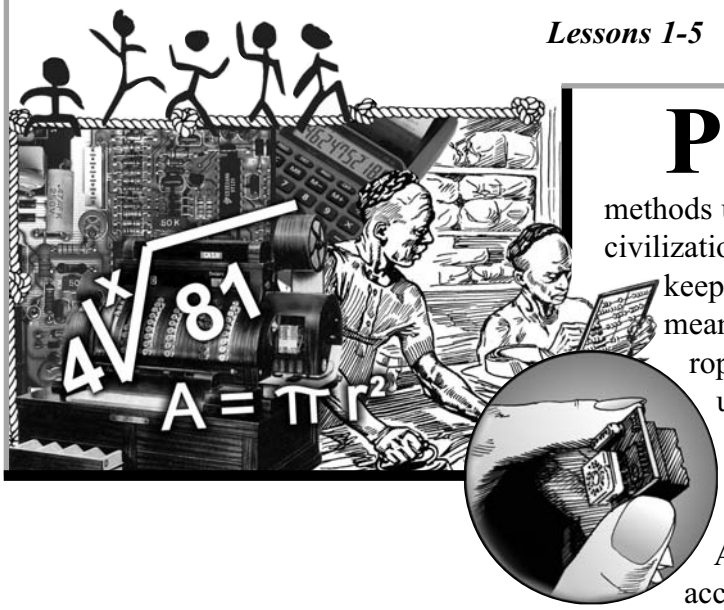
Chapter 6

Calculations

Section 1

Lessons 1-5







Professor K

Professor K has studied some of the various counting methods used by early man. Some civilizations tied knots in ropes to keep track of the count. Adding meant tying more knots in the rope; subtracting meant untying some of the knots.

Another method of counting that Professor K discovered men have used in the past was with "stick" figures. Adding and subtracting was accomplished in the same manner as with knots. The first "***calculator***" or adding machine was the Chinese ***abacus***. The abacus allowed people to add and subtract quickly. Professor K was fascinated with the fact that someone who was proficient at using an abacus could calculate problems very rapidly.

Later, mathematicians developed a sliding "stick" or *slide rule* that allowed for more complicated calculations, such as multiplication, division, and raising numbers to a power. Lever-powered and later electric-powered adding machines and cash registers were used in most businesses.

In the late 1940s and 1950s, scientists developed what we know today as ***computers***. These computers consisted of hundreds of tubes and wires, and ***data*** was saved on tapes. In the decade of the sixties, an electronics company by the name of Texas Instruments Incorporated™ developed the transistor. The transistor, and later, the computer chip allowed calculators and computers to do more in less time, in less space. Therefore, calculators and computers have become much smaller and yet process information and do calculations at a high rate of speed.

In this chapter you will learn how to use a scientific calculator. Many of the topics you have studied with Professor K

VOCABULARY

Abacus: a Chinese device used for performing calculations
Data: information, especially numerical information
Computer: a device used for computing data
Calculator: a device used for making calculations
Function keys: keys on a calculator that allows you to perform mathematical operations
LCD: liquid crystal display; a display of information on calculators and other devices, using a liquid crystal film

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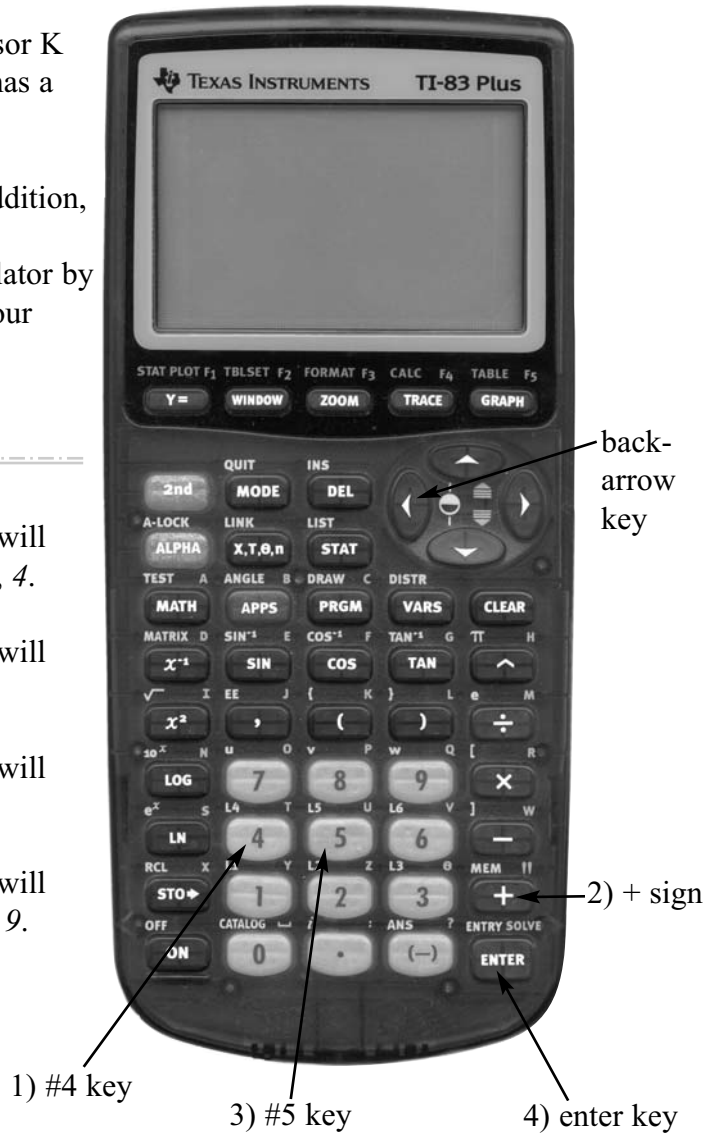
will be reviewed as a basis for the problems for you to solve with the calculator. Working these problems with a calculator makes many of the operations less awkward and time consuming. Professor K is always interested in making things easier and less time consuming.

The instructions that Professor K gives in this chapter will be for the TI-83 scientific calculator manufactured by Texas Instruments Incorporated™. Some of the keystrokes will be specific to the TI-83, but most scientific calculators will operate in much the same manner. If you use a different calculator, refer to the owner's manual for your particular calculator for assistance.

Just as Professor K began your study with basic mathematics, this first lesson will involve addition and subtraction using the TI-83. In the next lesson Professor K will deal with multiplication and division, then raising numbers to powers and extracting roots and finally, percents.

Looking at the picture to the right, Professor K wants you to notice that the scientific calculator has a number pad surrounded by ***function keys***. These function keys allow you to perform various mathematical operations on numbers including addition, subtraction, multiplication and division.

Begin to learn how to use the TI-83 calculator by working through the steps with Professor K on your calculator for the addition problems presented in **Example Set 1**.



Example Set 1

a) 4 + 5 = 9

a)

1) Press the #4 key on the number pad.

The ***LCD*** screen will show the number, *4*.

2) Then press the + sign function key.

The LCD screen will show *4* +.

3) Press the #5 key on the number pad.

The LCD screen will show *4* + *5*.

4) Press the "enter" function key (This key tells the calculator to perform the operations.)

The LCD screen will show the answer, *9*.

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b) 24 + 57 = 81

Press the #2 key and then the #4 key on the number pad.

b)

The LCD screen will show the number, *24*.

Then press the + sign function key.

The LCD screen will show *24* +.

Press the #5 key and then the #7 key on the number pad.

The LCD screen will show *24* + *57*.

Press the "enter" function key (This key tells the calculator to perform the operations.).

The LCD screen will show the answer, *81*.

c) 125 + 375 = 500

Press the #1, #2 and #5 on the number pad.

c)

The LCD screen will show the number, *125*.

Then press the + sign function key.

The LCD screen will show *125* +.

Press the #3, #7 and #5 on the number pad.

The LCD screen will show *125* + *375*.

Press the "enter" function key (This key tells the calculator to perform the operation(s).)

The LCD screen will show the answer, *500*.

To add numbers containing more digits, simply type in all the digits of each number before pressing the function key. Always look at the LCD screen before pressing the function key to make sure the number was typed in correctly. If an error in typing has occurred, use the function key labeled with a back-arrow (←) and retype the correct digit(s).

Professor K accomplishes subtraction of numbers using the TI-83 in the same manner as addition of numbers. Study **Example Set 2** to see how Professor K performs the operation of subtraction using the TI-83. Be sure to follow along with Professor K, working the problems on your calculator.



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Example Set 2

a) 6 - 3 = 3	a)
Press the #6 key on the number pad.	The LCD screen will show the number, *6*.
Then press the - sign function key	The LCD screen will show, *6 -*.
Press the #3 key on the number pad.	The LCD screen will show, *6 - 3*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *3*.
b) 55 - 25 = 30	b)
Press the #5 and #5 keys on the number pad.	The LCD screen will show the number, *55*.
Then press the - sign function key.	The LCD screen will show *55 -*.
Press the #2 and #5 keys on the number pad.	The LCD screen will show *55 - 25*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *30*
c) 456 - 123 = 333	c)
Press the #4, #5 and #6 on the number pad.	The LCD screen will show the number, *456*.
Then press the - sign function key.	The LCD screen will show *456 -*.
Press the #1, #2 and #3 on the number pad.	The LCD screen will show *456 - 123.*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *333*.

As in addition, to subtract numbers containing more digits, Professor K simply types in all the digits of each number before pressing the function key. Professor K reminds you always to look at the LCD screen before pressing the function key to



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make sure the number was typed in correctly. Again, if an error in typing has occurred, use the function key labeled with a back-arrow, ←, to erase the mistyped digit/s and retype the correct digit(s).

The TI-83 will do multiple calculations in one key-stroke of the "enter" key. To become familiar with this aspect of the TI-83, work along with Professor K as he works the problems in **Example Set 3** .



Example Set 3

a) 23 - 3 + 5 = 25	a)
Press the #2 and #3 keys on the number pad.	The LCD screen will show the number, *23*.
Then press the - sign function key.	The LCD screen will show *23* -.
Press the #3 key on the number pad.	The LCD screen will show *23 - 3*.
Then press the + sign function key.	The LCD screen will show *23 - 3* +
Press the #5 key on the number pad.	The LCD screen will show *23 - 3 + 5*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *25*.
b) 75 - 25 - 10 + 453 = 493	b)
Press the #7 and #5 keys on the number pad.	The LCD screen will show the number, *75*.
Then press the - sign function key.	The LCD screen will show *75* -.
Press the #2 and #5 keys on the number pad.	The LCD screen will show *75 - 25*.
Then press the - sign function key.	The LCD screen will show *75 - 25* -.
Press the #1 and #0 keys on the number pad.	The LCD screen will show *75 - 25 - 10.*
Then press the + sign function key.	The LCD screen will show *75 - 25 - 10* +.
Press the #4, #5 and #3 on the number pad.	The LCD screen will show *75 - 25 - 10* + *453.*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *493*.

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Apply what you have learned from Professor K about the TI-83 scientific calculator by working the activities for this lesson.

LIFE PRINCIPLE



"The man who removes a mountain begins by carrying away small stones."

—Chinese Proverb

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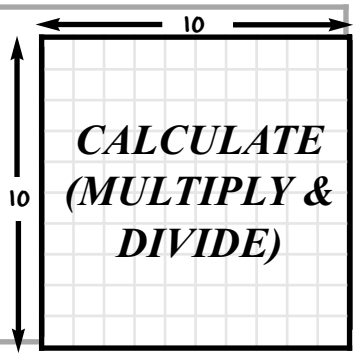
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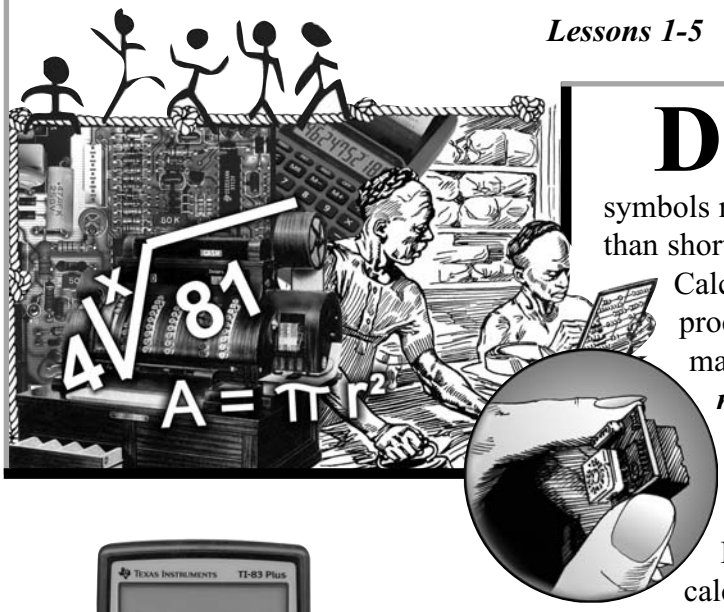
Chapter 6

Calculations

Section 1

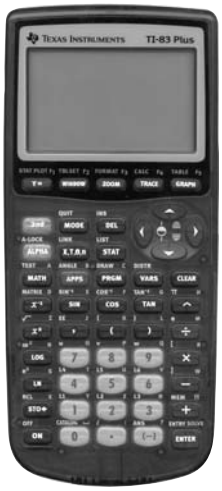
Lessons 1-5





Describing mathematical calculations can be very ***cumbersome***. Many of the symbols mathematicians use are nothing more than shorthand for describing calculations. Calculators and computers store and process information rapidly; they make the mathematician's job much easier. Long, ***monotonous*** and complicated calculations can be performed with relative ease compared to doing calculations by hand.

Learn more about using the TI-83 calculator by working on your calculator while Professor K follows the steps for the multiplication problems presented in **Example Set 1**.



Example Set 1

a) $3 \bullet 5 = 15$	a)
Press the #3 key on the number pad.	The LCD screen will show the number, *3*.
Then press the × (multiplication sign) function key.	The LCD screen will show *3 **.
Press the #5 key on the number pad.	The LCD screen will show *3 * 5*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *15*.

VOCABULARY

Cumbersome: clumsy to manage
Monotonous: lacking in variety; boring

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b) $20 \bullet 55 = 1{,}100$	b)
Press the #2 and #0 keys on the number pad.	The LCD screen will show the number, *20.*
Then press the × function key.	The LCD screen will show *20* *.
Press the #5 and #5 keys on the number pad.	The LCD screen will show *20 * 55.*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *1100*.
c) $120 \bullet 375 = 45{,}000$	c)
Press the #1, #2 and #0 keys on the number pad.	The LCD screen will show the number, *120*.
Then press the × function key.	The LCD screen will show *120* *.
Press the #3, #7 and #5 keys on the number pad.	The LCD screen will show *120 * 375.*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *45,000*.

To multiply numbers containing more digits, Professor K simply types in all the digits of each number before pressing the function key. Professor K reminds you always to look at the LCD screen before pressing the function key to make sure the number was typed in correctly. If an error in typing has occurred, use the function key labeled with a back-arrow, ←, to erase the mistyped digit(s) and retype the correct digit(s).



Professor K accomplishes the division of numbers using the TI-83 in the same manner as multiplication of numbers. Study **Example Set 2** to see how Professor K performs the operation of division using the TI-83. Be sure to follow along with Professor K, working the problems on your calculator.

Example Set 2

a) $6 \div 3 = 2$	a)
Press the #6 key on the number pad.	The LCD screen will show the number, *6*.
Then press the ÷ (division sign) function key.	The LCD screen will show *6 /*.
Press the #3 key on the number pad.	The LCD screen will show *6 / 3.*

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Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *2*.
b) $50 \div 25 = 2$	b)
Press the #5 and #0 keys on the number pad.	The LCD screen will show the number, *50*.
Then press the ÷ function key.	The LCD screen will show *50 /*.
Press the #2 and #5 keys on the number pad.	The LCD screen will show *50 / 25*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *2*.
c) $369 \div 123 = 3$	
Press the #3, #6 and #9 keys on the number pad.	The LCD screen will show the number, *369*.
Then press the ÷ function key.	The LCD screen will show *369 /*.
Press the #1, #2 and #3 keys on the number pad.	The LCD screen will show *369 / 123*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *3*.

Professor K points out, as in multiplication, to divide numbers containing more digits, simply type in all the digits of each number before pressing the function key. Always look at the LCD screen before pressing the function key to make sure the number was typed in correctly. Again, if an error in typing has occurred, use the function key labeled with a back-arrow (←) and retype the correct digit(s).



The TI-83 will do multiple calculations in one key-stroke of the "enter" key, regardless of the operations. Work the problems in **Example Set 3** with Professor K to become more familiar with this aspect of the TI-83.

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Example Set 3

a) $24 \div 3 \bullet 5$

Press the #2 and #4 keys on the number pad.	a) The LCD screen will show the number, *24*.
Then press the ÷ function key	The LCD screen will show *24 /*.
Press the #3 key on the number pad.	The LCD screen will show *24 / 3*.
Then press the × function key.	The LCD screen will show *24 / 3 **
Press the #5 key on the number pad.	The LCD screen will show *24 / 3 * 5*
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *40*.

b) $75 \div 25 \bullet 10 \div 2$

Press the #7 and #5 keys on the number pad.	b) The LCD screen will show the number, *75*.
Then press the ÷ function key.	The LCD screen will show *75 /*.
Press the #2 and #5 keys on the number pad.	The LCD screen will show *75 / 25*.
Then press the × function key.	The LCD screen will show *75 / 25 **.
Press the #1 and #0 keys on the number pad.	The LCD screen will show *75 / 25 * 10*.
Then press the ÷ function key.	The LCD screen will show *75 / 25 * 10 /*.
Press the #2 key on the number pad.	The LCD screen will show *75 / 25 * 10 / 2*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *15*.

Professor K is certain that you can apply what you have learned about the TI-83 scientific calculator by working the activities for this lesson.

Life Principle: **"Only love can be divided endlessly and still not diminish."**

—Anne Morrow Lindberg



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Basic Math Skills



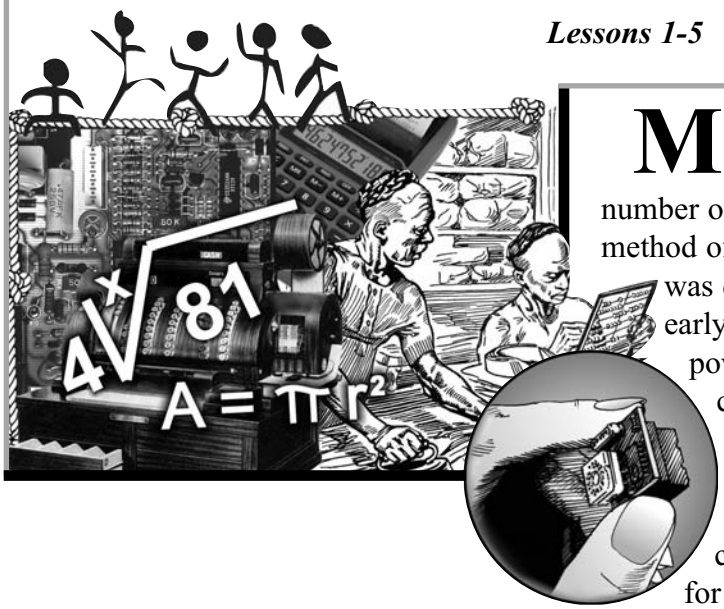
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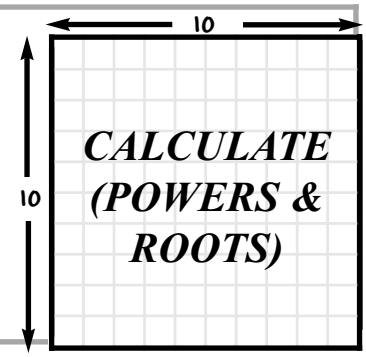
Chapter 6

Calculations

Section 1

Lessons 1-5





Mathematicians do not want to waste time writing multiplication of the same number over and over. Therefore, a shorthand method of writing some multiplication problems was developed between the late 1400s to the early 1600s, called raising a number to a power. By hand, this process may take considerable effort. However the calculator makes these calculations much easier and quicker.

Learn more about using the TI-83 calculator by working through the steps for squaring numbers on your calculator with Professor K.

VOCABULARY

x²: function key on a scientific calculator to square a number
Extracting the square root: finding the square root of a number
2nd: yellow function key on a scientific calculator to perform functions marked in yellow
Menu screen: a calculator or computer screen with list of possible options
^ (caret) key: a calculator key that performs the raise-a-number-to-a-power function

Example Set 1

a) 3^2

Press the #3 key on the number pad.

Then press the ***x²*** (square the number) function key.

Press the "enter" function key (This key tells the calculator to perform the operation(s).)

a)

The LCD screen will show the number, *3*.

The LCD screen will show 3^2.

The LCD screen will show the answer, *9*.

b) 55^2

Press the #5 and #5 keys on the number pad.

b)

The LCD screen will show the number, 55.

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Then press the x^2 function key.	The LCD screen will show 55^2.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *3025.*
c) 120^2	c)
Press the #1, #2 and #0 keys on the number pad.	The LCD screen will show the number, *120.*
Then press the x^2 function key.	The LCD screen will show 120^2.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *14400.*



To square numbers containing more digits, Professor K simply types in all the digits of the number before pressing the function key. As always, Professor K reminds you to look at the LCD screen before pressing the function key to make sure the number was typed in correctly. If an error in typing has occurred, use the function key labeled with a back-arrow (←) and retype the correct digit(s).

Professor K performs the process of ***extracting*** (taking) ***the square root*** of a number using the TI-83 in a similar manner as the squaring of numbers. Study **Example Set 2** to see how the operation of extracting the square root is performed by Professor K using the TI-83. Be sure to follow along while working the problems on your calculator.

Example Set 2

a) $\sqrt{25}$	a)
Press the yellow ***2nd*** key and then the x^2 on the number pad. This will perform the square root function shown in yellow on the face of the calculator.	The LCD screen will show the symbol, $\sqrt{\ }$.
Press the #2 and #5 keys on the number pad.	The LCD screen will show $\sqrt{25}$.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *5*.

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b) $\sqrt{121}$

Press the yellow 2nd key and then the x^2 on the number pad.

Press the #1, #2, and #1 keys on the number pad.

Press the "enter" function key (This key tells the calculator to perform the operation(s).)

b)

The LCD screen will show the symbol, $\sqrt{\ }$.

The LCD screen will show $\sqrt{121}$.

The LCD screen will show the answer, *11*.

As in squaring a number, Professor K points out that to extract the square root of a number containing more digits, simply type in all the digits of the number before pressing the function key. Always look at the LCD screen before pressing the function key to make sure the number was typed in correctly. Again, if an error in typing has occurred, use the function key labeled with a back-arrow (←) and retype the correct digit(s).



The TI-83 will raise numbers to powers other than 2. To become more familiar with this aspect of the TI-83, work along with Professor K while he solves the problems in **Example Set 3** and **Example Set 4**.

Example Set 3

a) 3^3

Press the #3 key on the number pad.

Press the math function key on the calculator.

Press the #3 key on the number pad. (Notice the cube (3) function is option #3 on the menu.)

Press the "enter" function key (This key tells the calculator to perform the operation(s).)

a)

The LCD screen will show *3*.

The LCD screen will show a ***menu screen.***

The LCD screen will show 3^3.

The LCD screen will show the answer, *27*.

b) 4^4

Press the #4 key on the number pad.

Press the ^ ***(caret) key*** on the number pad.

b)

The LCD screen will show the number, *4*.

The LCD screen will show a *4^*.

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Press the #4 key on the number pad.	The LCD screen will show *4 ^ 4*.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *256.*

In **Example Set 4** Professor K will show you how to use the TI-83 to extract roots other than 2. Remember, extracting a root means to find the equal factors of a number. An example of this is the fifth root of 32 = 2, because 2 × 2 × 2 × 2 × 2 = 32.

Example Set 4

a) $\sqrt[3]{64}$ (the cube root of 64)

	a)
Press the math function key on the calculator.	The LCD screen will show a menu screen.
Press the #4 key on the number pad. (Notice $\sqrt[3]{\ }$ function is option #4 on the menu.	The LCD screen will show $\sqrt[3]{\ }$.
Press the #6 and #4 keys on the number pad.	The LCD screen will show $\sqrt[3]{64}$.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *4*.

b) $\sqrt[4]{81}$ (the fourth root of 81)

	b)
Press the #4 (fourth root) key on the number pad.	The LCD screen will show 4.
Press the math function key.	The LCD screen will show a menu screen.
Press the #5 key on the number pad. (Notice $\sqrt[3]{6}$ function is option #5 on the menu.	The LCD screen will show *4* $\sqrt[3]{6}$.
Press the #8 and #1 keys on the number pad.	The LCD screen will show $4\sqrt[x]{81}$.
Press the "enter" function key (This key tells the calculator to perform the operation(s).)	The LCD screen will show the answer, *3*.



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Apply what you have learned with Professor K about the TI-83 scientific calculator by working the activities for this lesson.

Life Principle



"Beginning a thing may be easy—continuing is often harder."

—Unknown

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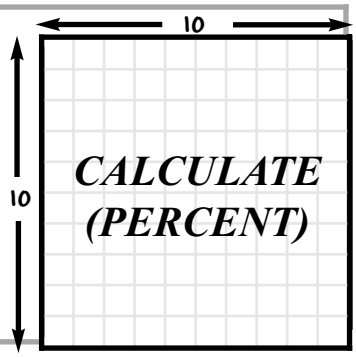
Basic Math Skills



Lesson 4

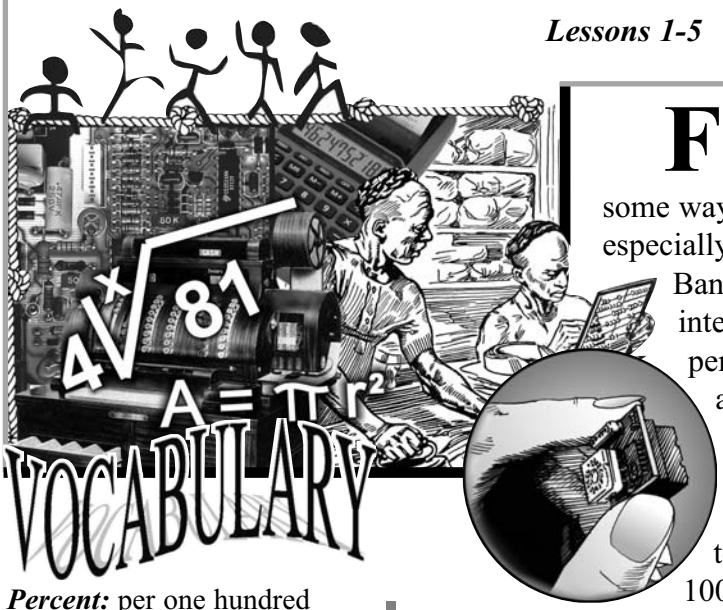
Chapter 6

Calculations



Section 1

Lessons 1-5



Percent: per one hundred
Discount: the amount a price is reduced on a product
Mark up: amount of money a store charges above the cost of an item
Profit: the difference between what a business pays for its purchases and the price at which the business sells those items to customers; selling price minus cost.
I = Prt: interest formula; interest = principal × rate × time
Interest, I: amount charged for a loan of money
Principal, P: amount of money borrowed
Rate, r: percentage charged on money borrowed
Time, t: amount of time until total payment is due; length of the loan

Finding the ***percent*** of numbers is a mathematical operation used daily in some way by almost everyone. *Percents* are especially important in the world of finance. Banks charge interest on loans and pay interest on savings accounts based on percent. Stores figure ***discounts***, ***mark ups*** and ***profits*** using percent. Government entities calculate tax rates on percentages.

In school, the grade earned on a test is usually scored based on a total of 100 points. The teacher calculates a percentage of correct answers and records a grade, such as 89%.

In this lesson Professor K will review the calculation of percentages while showing you how to use the TI-83 to aid your calculations of percentages.

Work through the steps for the percentage problems presented in the following examples with Professor K using the TI-83 calculator.

RULE

The formula for simple interest is ***I = Prt***, where ***I*** = the simple ***interest***, ***P*** = ***principal***, ***r*** = ***rate***, ***t*** = ***time*** of the loan.

Professor K uses the experiences of a friend, Roland, and Roland's wife, Jo Ann, to explain the use of the TI-83 calculator to work simple interest problems in **Example Sets 1 and 2.**

Example Set 1

Roland borrowed $5,000.00 from his local bank at an interest rate of 9.5%. Calculate the amount of simple interest Roland will pay in 2 years when the note is due.

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Step 1 Substitute the numbers from the problem into the interest formula ($I = P \bullet r \bullet t = Prt$). The interest, *I,* is the unknown. The principal, *P,* is \$5,000.00. The rate, *r,* is 9.5%, and the time, *t*, is 2 years.

Step 2 $I = Prt$ = 5,000(.095)(2) (Remember, the decimal equivalent of 9.5% is .095; move the decimal point two places to the left and drop the percent sign.)

Step 3 Press the keys on the TI-83 in the sequence listed below.

[5] [0] [0] [0] [×] [.] [0] [9] [5] [×] [2] [ENTER]

The answer will appear *950*. Therefore, Roland will pay \$950.00 interest on his loan of \$5,000.00 for two years.

Example Set 2

Jo Ann placed \$450.00 in her savings account. She does not plan to withdraw or add to the money until she retires 25 years from now. Calculate the amount of money Jo Ann will earn in interest on her savings account at the end of one year. The bank pays a simple interest rate of 4% per year on savings accounts.

Step 1 Substitute the numbers in the problem into the simple interest formula, $I = Prt$. P = \$450.00, r = 4% or .04 for multiplication purposes (move the decimal two places to the left), and t = 1 year.

$$I = 450(.04)(1)$$

Step 2 Press the keys on the TI-83 in the sequence listed below.

[4] [5] [0] [×] [.] [0] [4] [×] [1] [ENTER]

The answer will appear *18*. Therefore, Jo Ann will earn \$18.00 interest on her savings account containing \$450.00 in the first year.

In **Example Set 3** Professor K presents calculating discounts using Roland and Jo Ann's daughter, Karla to help him.

Example Set 3

Karla works at a local department store. A group of dresses were priced at \$89.99 each. Karla was instructed to label the dresses with a 25% discount. Calculate the amount of the discount and then the final selling price of the garments.



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Step 1

You must first calculate the amount of the discount. Multiply 89.99 times .25 (Move the decimal point in *25%* two places to the left.). Press the keys on the TI-83 in the sequence listed below.

8 9 . 9 9 × . 2 5 ENTER

This yields an answer of *22.50*. Therefore, the discount of 25% on $89.99 is $22.50.

Step 2

To determine the final selling price of the garment after the 25% discount you must subtract $22.50 from the original price of $89.99. Press the keys on the TI-83 in the sequence listed below.

8 9 . 9 9 - 2 2 . 5 0 ENTER

This yields an answer of *67.49*. Therefore, the final selling price after the 25% discount is $67.49.

Apply what you have learned from Professor K about using the TI-83 scientific calculator to solve problems involving percents by working the activities for this lesson.

Life Principle



"Everything is worth what its purchaser will pay for it."

—Publilius

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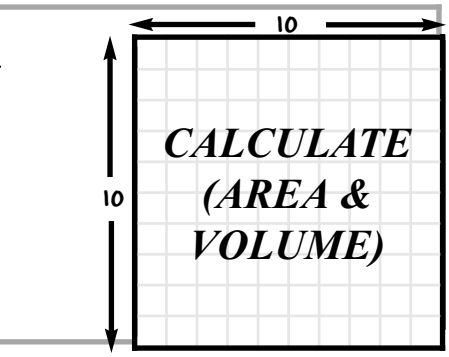
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Lesson 5

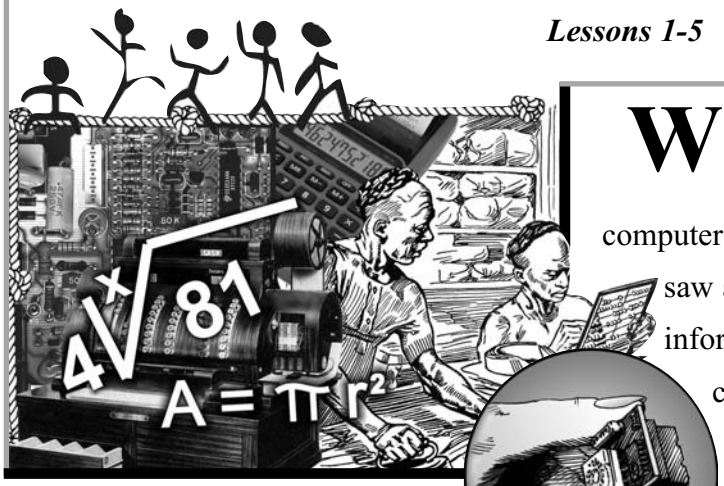
Chapter 6

Calculations

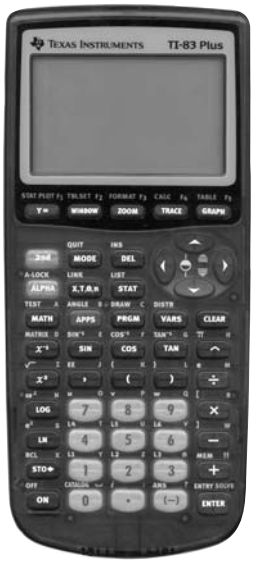


Section 1

Lessons 1-5



With the increase in availability and capabilities of calculators and computers in the last half of the 1900s, the world saw a dramatic increase in the processing of information and speed at which complicated calculations could be accomplished. Some calculations, especially in areas and volumes containing the factor of π, have become far less difficult. Professor K likes "less difficult." Also, Professor K reminds you that since the value of π is only an approximation, calculators and computers can use a value of π to include more decimal points than a person can use to manually calculate a problem with π. One finds it more difficult to perform calculations manually on any numbers with more than three decimal places. With the aid of calculators and computers, calculations can be made with the value of π containing hundreds of decimal places.



In this lesson, Professor K will review the calculation of areas and volumes while showing you how to use the TI-83 to aid in the calculations of these problems. For convenience and review, Professor K provides a chart of the formulas for area and volume on the following page. If you do not remember the meaning of the terms used in the formulas refer to Chapter 4.

VOCABULARY

A_S: surface area

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Formulas

Area:	
Rectangle: $A = lw$	Triangle: $A = \frac{1}{2}bh$
Circle: $A = \pi r^2$	Sphere: $A_s = 4\pi r^2$
Perimeter:	
Rectangle: $P = 2w + 2l$	
Circumference:	
Circle: $C = \pi d = 2\pi r$	
Volume:	
Rectangular prism: $V = lwh$	Pyramid: $V = \frac{1}{3}wlh$
Sphere: $V = \frac{4}{3}\pi r^3$	Cone: $V = \frac{1}{3}\pi r^2 h$
Cylinder: $V = \pi r^2 h$	

Work through the steps for the area and volume problems that Professor K presents in the following examples using the TI-83 calculator.

Example Set 1

A warehouse for Red Cross supplies is 347 feet wide and 721 feet long. Calculate the floor space of the warehouse.

Step 1 Choose the appropriate formula for this problem. In this problem the formula needed is for the area of a rectangle, $A = lw$

Step 2 Substitute the corresponding numbers from the problem into the formula. l = 721 feet, w = 347 feet → $A = 721 \times 347$

Step 3 Press the keys on the TI-83 in the sequence listed below.

7 2 1 × 3 4 7 ENTER

The answer will appear *250187*. Therefore, the area of the warehouse is 250,187 sq ft.

Example Set 2

An oil refinery has a holding tank in the shape of a sphere. The diameter of the tank is 80 feet. Calculate the number of cubic feet of oil the tank will hold.

Step 1 Choose the appropriate formula for this problem. In this problem the formula needed is for the volume of a sphere, $V = \frac{4}{3}\pi r^3$.

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Step 2 Substitute the corresponding numbers from the problem into the formula. diameter = $d = 80$; radius = $r = \frac{1}{2} \bullet d = 40$ feet. $V = \frac{4}{3}\pi(40^3)$

Step 3 Press the keys on the TI-83 in the sequence listed below.

4	÷	3	×	2nd	^	×	(	4	0	^	3	)	ENTER

The answer will appear *268082.5731*. Therefore, the spherical oil tank will hold 268,082.5731 cubic feet of oil.

Professor K wants you to notice in **Example Set 2** Step 3**,** that the value of π to nine decimal places is stored in the calculator. The number π is printed in yellow on the face of the calculator and is accessible by pressing the yellow *2nd* key and then the caret key, ^. To view the nine decimal place number for π stored in the TI-83, press the 2nd key and then caret key. The Greek letter π will appear on the screen. Then press "ENTER." The number, *3.141592654,* will appear on the right of the screen as the value of π.

Professor K also points out in Step 3 of **Example Set 2** that the number *40* was raised to the third power by using the caret (^) key. Also, 40^3 was placed in parentheses. Often it is important to set off numbers and operations on them with parentheses so the calculator will perform the operation in the parentheses first and then the other operations. Calculators and computers follow the rules for the *Order of Operations* (from Chapter 3, Lesson 6).

Remember also that in Step 3, a fraction is another method to signify division and therefore, $\frac{4}{3}$ can be calculated by entering 4 ÷ 3 into the calculator. **Example Set 3** will show how Professor K uses the TI-83 to work a problem involving the surface area of a cylinder. In Chapter 4 you calculated the surface area of a cylinder by calculating the area of each circular end; then you calculated the circumference of the circular end to determine the length of the rectangular side. (When the side of the cylinder is "unrolled" it appears to be a rectangle. Refer to Chapter 4.) Next, the area of the rectangle was calculated and added to the two areas of the circular ends. Professor K shows you now that this process, which yielded the surface area of a cylinder, can be shortened to the following formula: $A_s = 2\pi r(h + r)$

Work through the steps for calculating the surface area of a cylinder with Professor K as shown in **Example Set 3** using the TI-83 calculator.



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Example Set 3

Calculate the surface area of a cylinder with a radius of 4 cm and a height of 9 cm.

Step 1 Substitute the corresponding numbers from the problem into the formula for the surface area of a cylinder, $A_s = 2\pi r(h + r)$; radius = r = 4 cm; height = h = 9 cm.
$A_s = 2\pi(4)(9 + 4)$

Step 2 Press the keys on the TI-83 in the sequence listed below.

[2] [×] [2nd] [^] [×] [4] [×] [(] [9] [+] [4] [)] [ENTER]

This yields an answer of *326.725636*. Therefore, the surface area of a cylinder with a radius of 4 cm and height of 9 cm is *326.725636* sq cm.

In Step 2 of **Example Set 3**, the parentheses, ( ), around 9 + 4 is of utmost importance. An entirely different answer will be obtained if the problem is worked without the parentheses. The TI-83 does not require the use of the times sign, *, between the *4* and the *(9 + 4)* or the *2* and the π, however, if you form the habit of placing an * everywhere it is needed, then when you are using a calculator that requires the *, Professor K knows you will have no problem adapting to a different calculator.

Show Professor K that you can apply what you have learned about using the TI-83 scientific calculator to solve problems involving areas and volumes by working the activities for this lesson.

Life Principle



"To the problems of your life,
you are the only solution."

—Jo Coudert
American television executive

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Basic Math Skills



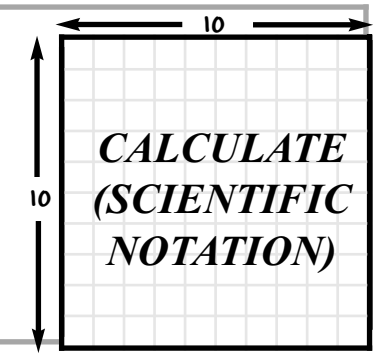
Lesson 6

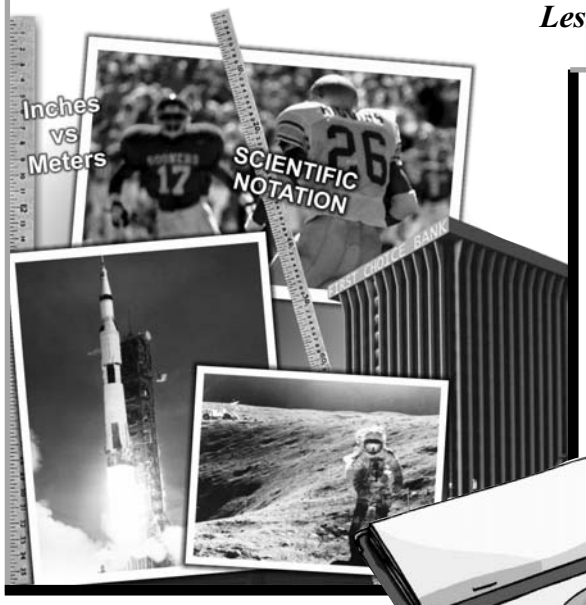
Chapter 6

Calculations

Section 2

Lessons 6-10







Professor K

Professor K remembers an old axiom that states, "Necessity is the mother of invention." Mathematicians have constantly looked for ways to make solving problems easier. Professor K believes that an important part of solving a problem is making calculations.

Scientific notation is an "invention" of mathematicians to make the "necessity" of writing and making calculations with very large or very small numbers more ***manageable***. The inventions of calculators and computers were very helpful in making complicated calculations. However, before these two useful devices, mathematicians developed scientific notation.

Scientific calculators such as the TI-83 will show only ten digits of an answer. If the answer has more than ten digits to the left of the decimal point, the calculator automatically changes the number to scientific notation. For answers containing decimals, the answers with more than ten total digits are rounded to the nearest decimal place.

In this lesson Professor K will review the calculation of problems containing scientific notation while showing you how to use the TI-83 to aid your calculations of large numbers.

Work through the steps for the problems presented by Professor K in the following examples using the TI-83 calculator.

VOCABULARY

Scientific notation: a shorthand method for writing very large or very small numbers

Manageable: able to be managed

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Example Set 1

Add $3.456 \times 10^9 + 7.9832 \times 10^5$



Press the keys on the TI-83 in the sequence listed below.

[3] [.] [4] [5] [6] [2nd] [,] [9] [+]
[7] [.] [9] [8] [3] [2] [2nd] [,] [5] [ENTER]

The answer will appear *3456798320*.

In **Example Set 1** the [2nd] and [,] keys were entered because the letters, "EE" were listed in yellow on the face of the calculator. *EE* is the calculator notation for scientific notation in multiplying a number times 10 raised to a power. Professor K wants you to notice that the answer was not written in scientific notation form because the answer did not contain more than ten digits.

Look at **Example Set 2** and work through the multiplication problem presented with Professor K using your TI-83 calculator.

Example Set 2

Perform the following calculation: $(2.45 \times 10^{12})(9.36 \times 10^{16})$

Press the keys on the TI-83 in the sequence listed below.

[(] [2] [.] [4] [5] [2nd] [,] [1] [2] [)] [×]
[(] [9] [.] [3] [6] [2nd] [,] [1] [6] [)] [ENTER]

The answer will appear *2.2932E29.* Notice that the answer on the screen does not contain a *10* raised to a power. The "E" is the calculator's shorthand for "$\times 10^x$". The answer to this problem would be written on your answer page as 2.2932×10^{29}.

Professor K points out that a scientific calculator can make fractional calculations containing numbers in scientific notation form.

Example Set 3

Perform the following calculation: $\dfrac{(3.4 \bullet 10^4)(4.2 \bullet 10^{-3})}{2.6 \bullet 10^{-4}}$

Remember that fractions indicate division, therefore, this problem contains multiplication in the numerator and then division by the denominator.

To work this problem on the TI-83 press the keys in the sequence listed below.

[(] [3] [.] [4] [2nd] [,] [4] [)] [×] [(] [4] [.] [2] [2nd] [,]
[(-)] [3] [)] [÷] [(] [2] [.] [6] [2nd] [,] [(-)] [4] [)] [ENTER]

This yields an answer of *549230.7692.* The parentheses are of great importance to this problem. Be sure to place the parentheses in the proper locations. Also, note that the key marked (-) is pressed to signify a negative number. Do not press the operation key, -, on the right of the calculator face; this key is for subtraction.

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Apply what you have learned with Professor K about using the TI-83 scientific calculator to solve scientific notation problems by working the activities for this lesson.

Life Principle



"Small is the number of them that see with their own eyes and feel with their own hearts."

—Albert Einstein

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Basic Math Skills



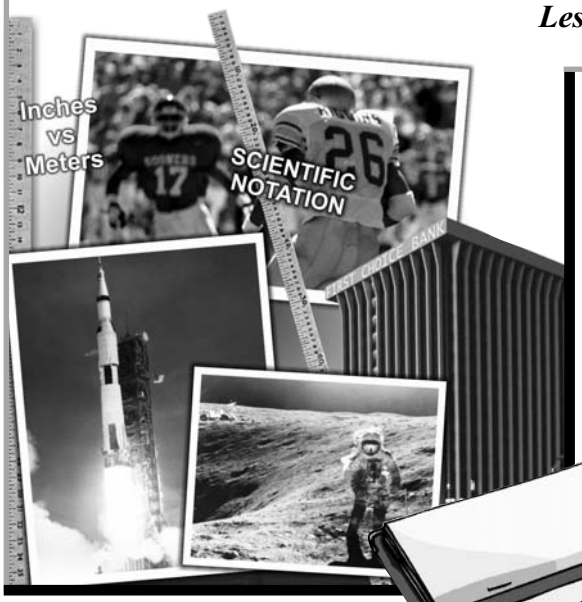
Calculations

Lesson 7

Chapter 6

Section 2

Lessons 6-10



10

10

CALCULATE (BALANCING A CHECKBOOK)

A letter from the bank where Roland had borrowed money informed him that he had an ***overdraft*** in his checking account. Roland could not believe that he had miscalculated the money remaining in his account. This possible miscalculation had caused Roland to write a ***hot-check***. Roland looked at his ***ledger*** and compared his records with that of the bank to locate the error.



Professor K



VOCABULARY

Overdraft: an attempt to draw more money from a bank than is in your account
Hot-check: a check that is not backed by money in a bank account
Ledger: a record of money transactions
Check: a document signed by the owner for transfer of funds
Balance: the amount of money remaining in an account after credits and debits
Debit: money subtracted from an account
Credit: money added to an account

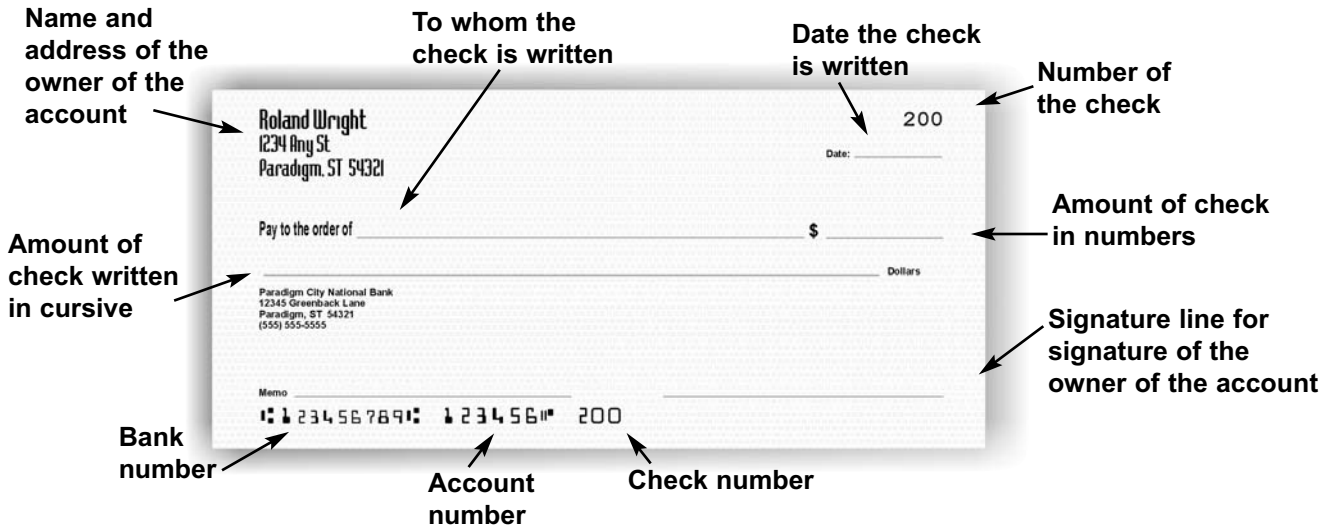
Follow the examples in this lesson to learn about ***checks*** and ledgers as Roland looks at his ledger while Professor K helps him recalculate the ***balance*** in his checking account. Work through the steps for the problems presented in the following examples using the TI-83 calculator.

Before making entries in a ledger, Professor K points out that you must first write a check. Professor K shows you in **Example Set 1** all the different areas of a check. In **Example Set 2** Professor K will show you how to fill in a check.

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Example Set 1

Below is the picture of one of Roland's checks. Notice all the different parts of a check.

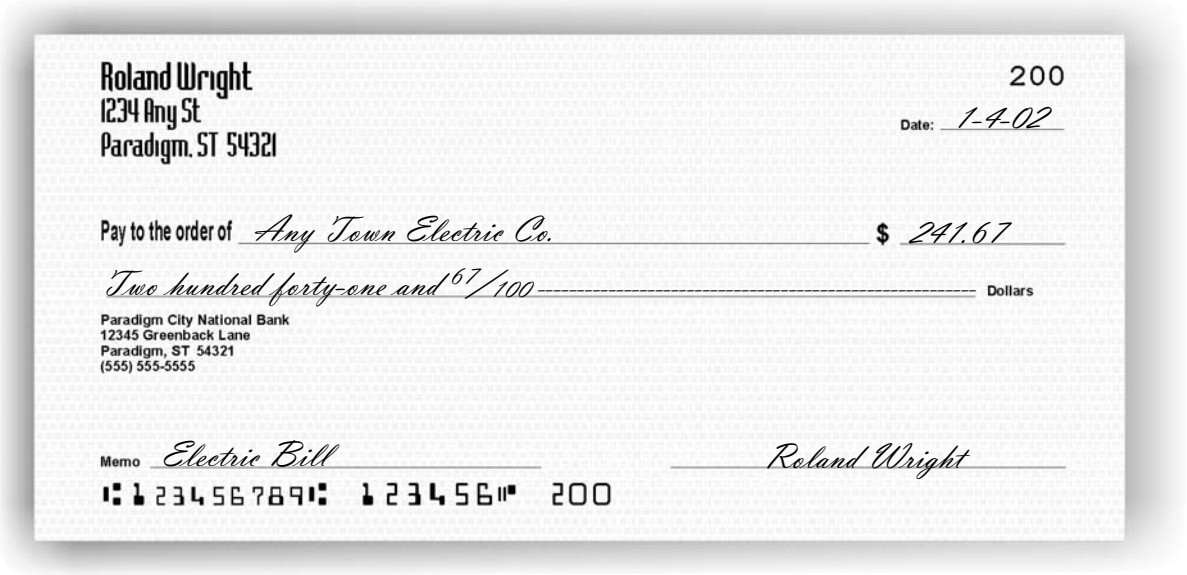


The line marked "MEMO" is sometimes labeled, "FOR." This line is to make a notation of the purpose for writing the check (i. e. repairs, groceries, electric bill, etc.).

The line under the "Pay to the order of" line and above the name of the bank, is used to write out in cursive the amount of the check in *words*. At the end of the fraction, a line should be drawn to the word "dollar" to prevent someone adding words later to the amount.

Example Set 2

Below is the picture of one of Roland's checks that has been filled in. Notice how all the different parts of a check are filled in.



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Notice that the check was written to the *Any Town Electric Co.* in the amount of $241.67. The amount is written out in words, the MEMO line is filled in and Roland signed the check.



DEFINITION: LEDGER

A ledger is a book for keeping a record of credits and ***debits*** to an account.



- A record of *expenses* and *income* from the Junior class fund-raiser is a *ledger*.
- A business keeps a record of *income* and *expenses* in a *ledger* to determine profits.
- A checkbook register is a type of ledger.

Look at **Example Set 3** to see the page from Roland's checkbook register where the mistake occurred that caused Roland's overdraft.

Example Set 3

Number	Date	Description of Transaction	Payment/Debit	Deposit/Credit	Balance
200	1/4	Any Town Electric Co.	241.67		358.25
201	1/7	Good Food Grocery	35.64		322.61
202	1/8	Roll On Gas Station	15.00		307.61
	1/8	Paycheck		225.00	532.61
203	1/8	Pants Galore	85.00		447.61
204	1/10	Property taxes	316.40		131.21
205	1/20	Good Food Grocery	75.00		56.21
206	1/24	Aunt Polly - B'day present	66.25		19.96

Notice that Roland has made entries in the appropriate places in his check register. Roland wrote the numbers of the checks in the column labeled "Number" and the date each check was written in the column labeled "Date." Roland then wrote *to whom* the check was written or the purpose of the check in the column labeled "Description of Transaction." Roland placed the *amount* of the check in the column labeled "Payment/Debit" and the amount of *deposits* in the column labeled "Deposit/Credit." After making each entry in his register, Roland then used a calculator to calculate the balance, or the amount of money remaining in his account.

Working through Roland's calculations in his check register, you must assume that the first line, *Any Town Electric Co.*, shows a correct balance, *$358.25*. Enter the initial balance, $358.25 into your calculator and subtract the next debit, *$35.64* from the previous balance, and press the "enter" key. Your balance should equal that of Roland's. Continue through the ledger subtracting the debits from the previous balance and adding the ***credits***. Check each of your balances against those of Roland's. Notice that the final balance in the ledger should have been - $10.04. Roland had entered *36.25* instead of 66.25 into his calculator without looking at his LCD screen to check his entry before pressing the *enter* key. The importance of making sure you have entered the correct numbers into the calculator cannot be overly expressed.

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Show Professor K that you can apply what you have learned about using the TI-83 scientific calculator to work ledger problems by working the activities for this lesson.

Life Principle



"How much you get out of life, depends on how much you put into life."

—Anonymous

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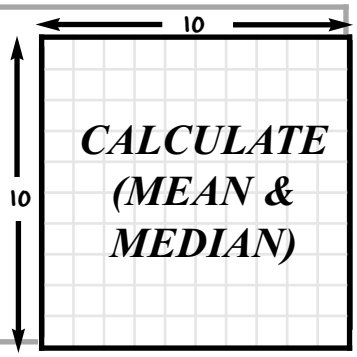
Basic Math Skills



Lesson 8

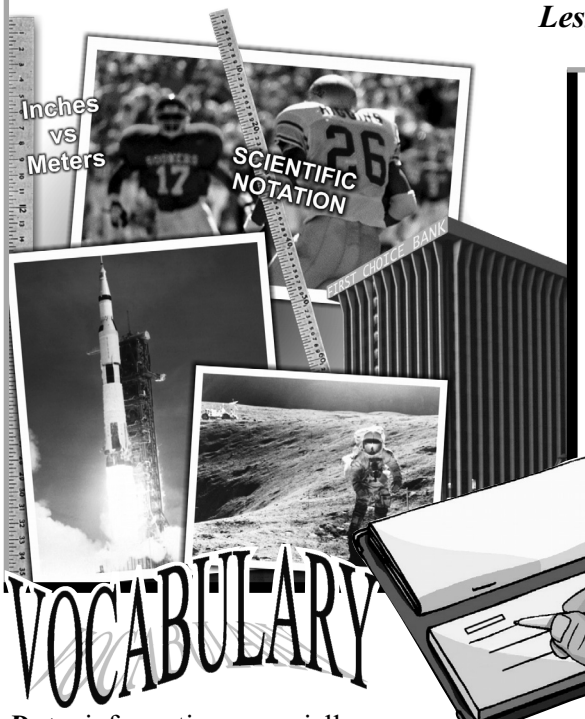
Chapter 6

Calculations



Section 2

Lessons 6-10





Averages are used everyday by various people and organizations to analyze ***data***. Averages help us to compare large and small groups of numbers with each other. Professor K and other teachers average students' tests grades. ***Governmental*** agencies average various types of data to help in the formulation of rules, laws and procedures. Increases and decreases in taxes from year to year are reported based on what the average tax increase or decrease will be.

Calculators and computers make the calculation of the ***mean*** or average of a list of numbers much easier. In this lesson Professor K will show you how to use your calculator to calculate the *mean* for groups of data. Also, Professor K will review the ***median***, ***mode*** and ***range*** of a list of numbers. Look at the examples with Professor K and work through the problems with him using your scientific calculator. Professor K believes you know enough about your calculator now, so that he does not have to mention each individual keystroke.

One of Professor K's friends is a math student. This friend is the subject of **Example Set 1**.

VOCABULARY

Data: information, especially numerical
Governmental: pertaining to federal, state or local government agencies and procedures
Mean: average (referring to data)
Median: the middle number of a set of data; the middle of a highway
Mode: the number or item occurring most frequently in a set of data
Range: from lowest to highest in a set of data, the difference between the highest and lowest

Example Set 1

Carlos wants to average his test grades for the semester in math class. Carlos' list of tests scores are 90, 92, 94, 91, 80, 88, 85, 87, 75, 94, 80, 82, 86, 91, 99, 77, and 89. Calculate Carlos' average for his math class.

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Step 1 Type the following into the calculator: 90 + 92 + 94 + 91 + 80 + 88 + 85 + 87 + 75 + 94 + 80 + 82 + 86 + 91 + 99 + 77 + 89. Then press the *enter* key to perform the addition of all the numbers to obtain the total of all the test scores of 1480.

Step 2 Count the number of test scores entered into the calculator. The number of test scores is 17.

Step 3 To determine Carlos' average test grade, the *number of tests divides* the total of all the test scores. To complete the calculation of Carlos' test average press the ÷ key, type *17*, and press the *enter* key. The answer, *87.05882353* will appear on the screen. Carlos' test average would be rounded to the nearest whole number, or 87. Notice that when the ÷ key was pressed after calculating the total of all the test scores, the screen displayed "Ans/". The TI-83 understands to go to the last answer calculated for the numerator of the fraction. This saves the time and effort required to retype the previous answer.

Professor K traveled through Death Valley during a trip to California. Memories of this trip caused Professor K to think of the problem in **Example Set 2**. Follow the steps in **Example Set 2** to find the *average daily temperature* for a particular week in Death Valley.

Example Set 2

In Death Valley the temperatures recorded for one week were 110°, 112°, 111°, 115°, 113°, 116° and 115°. Calculate with Professor K the *average* daily temperature for that week, plus the *median* temperature, the *mode*, and the *range*.

Step 1 Type the following into the calculator followed by the *enter* key: 110 + 112 + 111 + 115 + 113 + 116 + 115. The answer will appear on the screen as *792*.

Step 2 Since seven numbers were added together in Step 1, seven must divide the total to obtain the average daily temperature. After pressing the ÷ key, the screen will display "Ans/". After pressing the *7* key the screen displays "Ans/ 7." The answer, *113.1428571*, is displayed after pressing the *enter* key. Rounding the answer to the nearest whole number makes 113°, the *average daily temperature* in Death Valley for this particular week.

Step 3 The *median* (middle of the data set) is calculated by first arranging the data in numerical order: 110, 111, 112, 113, 115, 115, 116. In this problem, the middle of the data (an equal number of items on either side) is the number *113*. Therefore, the median temperature for the week was 113°.

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Step 4 To determine the *mode*, simply look at the data and determine which number, if any, occurs the most. In this list of temperatures 115° occurs most often, therefore, 115° is the mode.

Step 5 The *range* is determined by subtracting the smallest number in the data set from the largest. To calculate the range of the temperatures, *110* will be subtracted from *116*. The range is 116 - 110 = 6. Therefore, the range for the temperatures for this week in Death Valley is 6°.

Example Set 3

Determine with Professor K the *mean*, *mode*, *median*, and *range* of the following list of numbers: 3, 45, 24, 4, 55, 87, 14, 25, 24, 23, 24, 3, 16, 17.

Step 1 Type the following into the calculator followed by the *enter* key: 3 + 45 + 24 + 4 + 55 + 87 + 14 + 25 + 24 + 23 + 24 + 3 + 16 + 17. The answer will appear on the screen as *364*.

Step 2 Since fourteen numbers were added together in Step 1, *14* must divide the total to obtain the average of the numbers. After pressing the ÷ key, the screen will display "Ans/ ". After pressing the #1 and #4 keys the screen displays "Ans/ 14". The answer, 26, is displayed after pressing the "Enter" key. The average of the list of numbers is 26.

Step 3 The *median* (middle of the data set) is calculated by first arranging the data in numerical order: 3, 3, 4, 14, 16, 17, 23, 24, 24, 24, 25, 45, 55, 87. In this problem, the middle of the data (an equal number of items on either side) is between the numbers *23* and *24*. Therefore, the average of these two numbers must be calculated to determine the median: *23* + *24* = 47 and 47 ÷ 2 = 23.5. So, 23.5 is the median of the list of numbers.

Step 4 To determine the *mode*, simply look at the data and determine which number, if any, occurs the most. In this list of numbers, *24* occurs most often, therefore, *24* is the mode.

Step 5 The *range* is determined by subtracting the smallest number in the data set from the largest. To calculate the range of these numbers, *3* will be subtracted from *87*. The range is *87* - *3* = 84. Therefore, the range for this list of numbers is *84*.

Apply what you have learned about using a calculator to calculate the *mean*, *median*, *mode*, and *range* by working the activities for this lesson.



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Life Principle



"While in the middle of a situation,
checkout the range of solutions."

—Anonymous

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Basic Math Skills



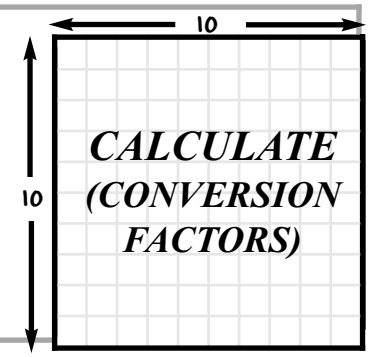
Calculations

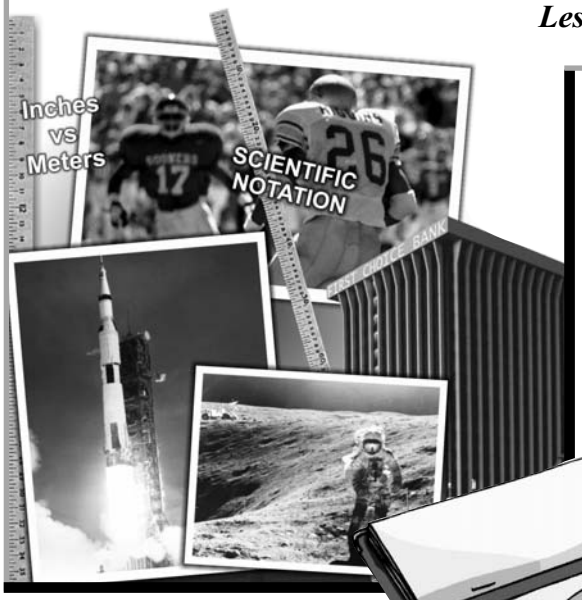
Lesson 9

Chapter 6

Section 2

Lessons 6-10





Early man did not have to worry too much about ***precise*** calculations and measurements. When working with numbers and measurements their calculations could be inexact and still accomplish what was needed at the time. However, Professor K thinks of how the pyramids are examples of precise angles and measurements that ***confound*** historians and mathematicians even today.

With the onset of the Industrial Revolution in the eighteen hundreds and the *space age* of the late twentieth century, absolutely precise calculations became of extreme importance. The *Apollo* missions to the Moon had to use precise calculations, because even a slight miscalculation leaving the Earth would result in a great ***discrepancy*** thousands of miles later. Such a miscalculation could have caused the *Apollo* mission to miss the Moon.

With the development of more ***sophisticated*** weapons of war, militaries around the world had to have precise measurements of *distance*, ***poundage*** of bombs, and *volumes* of fuels so they could locate and destroy specific targets.

This lesson will show you how to use the conversion factors necessary to convert *length measurements* between the English and Metric Systems with the aid of a calculator. (Professor K points out that the conversions shown on the next page are more accurate, having more decimal places than in previous lessons.) Previously you performed calculations involving conversion factors between the English and Metric Systems *without* the aid of a calculator so those conversion factors were rounded to make the calculations easier.

VOCABULARY

Precise: accurate
Confound: baffle; confuse
Discrepancy: difference; disagreement; failure to tally
Sophisticated: advanced
Poundage: size; weight; as with bombs, explosive force

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Table 9.1

Length

one inch (in)	=	2.54 centimeters (cm)
one mile (mi)	=	1.609344 kilometers (km)
one meter (m)	=	39.3708 inches (in)
one yard (yd)	=	0.9144 meter



Table 9.1 shows the conversion factors for various measures of *length* between the English and Metric systems of measurements. Look with Professor K at **Example Sets 1, 2 and 3** and follow along with your calculator the process of converting measures of *length* between the English and Metric Systems.

Example Set 1

Professional football teams are very interested in how fast a player can run a 40-yard dash. At one particular stadium, the field was accidentally marked off in meters instead of yards. The team could not put off tryouts so a conversion was calculated to determine the number of meters contained in 40 yards.

$$40\text{ yds}\bullet\frac{3\text{ ft}}{1\text{ yd}}\bullet\frac{12\text{ in}}{1\text{ ft}}\bullet\frac{1\text{ m}}{39.3708\text{ in}}=\frac{40\text{ yds}\bullet 3\text{ ft}\bullet 12\text{ in}\bullet 1\text{ m}}{1\text{ yd}\bullet 1\text{ ft}\bullet 39.3708\text{ in}}=$$

$$\frac{40\bullet 3\bullet 12\bullet 1\text{ m}}{1\bullet 1\bullet 39.3708}=\frac{1440\text{ m}}{39.3708}=36.575\text{ m}$$

The calculations show that *40 yards* equals *36.575 meters*. Professor K typed the following into his calculator to obtain the answer.

(40 × 3 × 12 × 1) ÷ (1 × 1 × 39.3708) <ENTER>

Notice in **Example Set 1** the conversions are placed in the *numerator* and *denominator* so that the units divide out as shown. This helps to insure that the multiplications and the divisions are performed properly to obtain the correct conversion. You may want to look back at Chapter 3 for further review of conversion factors.

Example Set 2

In the previous example, *40 yards* equaled *36.575 meters*. Calculate the number of inches in 36.575 meters.

$$36.575\text{ m}\bullet\frac{100\text{ cm}}{1\text{ m}}\bullet\frac{1\text{ in}}{2.54\text{ cm}}=\frac{36.575\text{ m}\bullet 100\text{ cm}\bullet 1\text{ in}}{1\text{ m}\bullet 2.54\text{ cm}}=1439.96063\text{ inches}$$

Professor K typed the following into his calculator to obtain the answer.

(36.575 × 100 × 1) ÷ (1 × 2.54) <ENTER>

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Example Set 3

The speed at which our entire solar system is moving through space is estimated at 700 miles per minute. Convert the speed our solar system is moving through space into kilometers per hour.

Step 1 Refer to **Table 1** for the conversion of *miles* into *kilometers*.
One mile = 1.609344 kilometers (km)

Step 2 Remember that one hour = 60 minutes.

Step 3 Set up the conversion of *700 miles per minute* into *kilometers per hour* and use your calculator to complete the calculations.

$$\frac{700 \text{ miles}}{1 \text{ minutes}} \bullet \frac{60 \text{ minutes}}{1 \text{ hour}} \bullet \frac{1.609344 \text{ km}}{1 \text{ mile}} = \frac{700 \ \cancel{\text{miles}}}{1 \ \cancel{\text{mile}}} \bullet \frac{60 \ \cancel{\text{minutes}}}{1 \ \cancel{\text{minute}}} \bullet \frac{1.609344 \text{ km}}{1 \text{ hour}} =$$

67,592.488 km per hour

Our solar system is moving through space at a speed of *67,592.448 kilometers per hour*. Professor K typed the following into his calculator to obtain the answer.

$(700 \times 60 \times 1.609344) \div (1 \times 1 \times 1)$ <ENTER>

Notice in Step 3 how Professor K used the conversion of *60 minutes = 1 hour* to convert *minutes* to *hours*. Also, the word, "per," signifies a fraction or division. The unit after the word, "per," must be placed in the denominator.

Professor K moved the units in the denominator around to make the division of the units more understandable. This process is justified because the order in which numbers are multiplied does not change the answer (Commutative Property: $2 \bullet 3 = 3 \bullet 2$).

Apply what you have learned about converting *units of length* between the English and Metric Systems by working the activities for this lesson.

Life Principle



"A journey of a thousand miles,
begins with a single step."
—Chinese proverb

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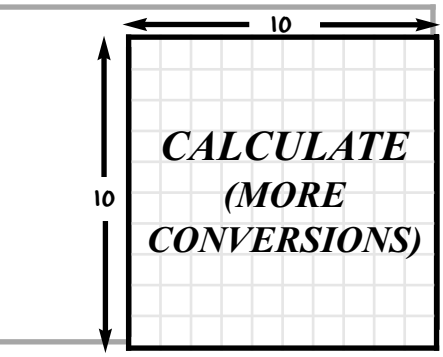
Calculations

Lesson 10

Chapter 6

Section 2

Lessons 6-10







Professor K

In this lesson, Professor K will show you the conversion factors necessary to convert area measurements between the English and Metric Systems with the aid of a calculator. (These conversions, as with length, are shown more accurately with more decimal places than in previous lessons.) Previously you performed calculations involving conversion factors between the English and Metric Systems ***manually***, and these conversion factors were rounded to make the calculations easier.

Table 10.1 shows the conversion factors for various measurements of *area*. These conversion factors are used in the following examples. Look at **Example Sets 1, 2 and 3** to see how Professor K converts measurements of *area* between the English System of measurements and the Metric System of measurements.

Table 10.1

Area		
square ***centimeter***	=	0.155000 sq in.
square ***meter***	=	10.763910 sq ft
square inch	=	645.16 sq mm
square foot	=	0.09290304 sq meter
square yard	=	0.836127 sq meter
one sq ft	=	144 sq in.

VOCABULARY

Manually: without the help of machines; by hand
Centimeter: $^1/_{100}$ of a meter
Meter: basic unit of length in the metric system

Professor K reminds you that as you work problems involving fractions, the *fraction bar* indicates *division*.

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Example Set 1

The *surface area* of the outside skin of a rocket is 345.575 sq ft. Convert the surface area of the rocket into sq millimeters (mm) so a factory in Europe can manufacture the rocket. Perform the calculations along with Professor K using your calculator.

$$345.575 \text{ sq ft} \bullet \frac{144 \text{ sq in}}{1 \text{ sq ft}} \bullet \frac{645.16 \text{ sq mm}}{1 \text{ sq in}} =$$

$$\frac{345.575 \cancel{\text{ sq ft}} \bullet 144 \cancel{\text{ sq in}} \bullet 645.16 \text{ sq mm}}{1 \cancel{\text{ sq ft}} \bullet 1 \cancel{\text{ sq in}}} = 32{,}104{,}968.05 \text{ sq mm}$$

The surface area of the outside skin of a rocket in square milliliters is 32,104,968.05 sq mm. Professor K typed the following into his calculator to obtain the answer.

(345.575 × 144 × 645.16) ÷ (1 × 1) <ENTER>

Example Set 2

The playing field for a certain sport is 80 meters long and 30 meters wide. Calculate the *area* of the field and then convert the answer to *square feet*.

Step 1 Calculate with Professor K the area of the playing field using your calculator. (Find the area of a rectangle.)

$A = l \times w$ = 80 m × 30 m = 2,400 sq meters

Step 2 Convert 2,400 sq meters into sq feet.

$$2400 \text{ sq meters} \bullet \frac{10.763910 \text{ sq ft}}{1 \text{ sq meter}} =$$

$$\frac{2400 \cancel{\text{ sq meters}} \bullet 10.763910 \text{ sq ft}}{1 \cancel{\text{ sq meter}}} = 25833.384 \text{ sq ft}$$

The area of the field was 25,833.384 sq ft. Professor K typed the following into his calculator to obtain the answer.

(2400 × 10.763910) ÷ 1 <ENTER>

Example Set 3

A sheet of copy paper is 8.5 inches wide and 11 inches long. Calculate the area of the sheet of paper in square millimeters.

Step 1 Calculate the area of the sheet of copy paper in square inches using your calculator. 8.5 in. • 11 in. = 93.5 sq in.

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Step 2 Convert 93.5 sq in. into square millimeters using your calculator to perform the multiplications and divisions.

$$93.5 \text{ sq in} \bullet \frac{645.16 \text{ sq mm}}{1 \text{ sq in}} = \frac{93.5 \cancel{\text{ sq in}} \bullet 645.16 \text{ sq mm}}{1 \cancel{\text{ sq in}}} = 60,332.46 \text{ sq mm}$$

The area of a sheet of copy paper 8.5 inches wide and 11 inches long is *60,322.46 sq mm*. Professor K typed the following into his calculator to obtain the answer.

(93.5 × 645.16) ÷ 1 <ENTER>

Apply what you have learned with Professor K about converting units of area between the English and Metric Systems by working the activities for this lesson.

Life Principle



"The degree to which we are thankful is a sure measure of our emotional and spiritual health."

—John Mason

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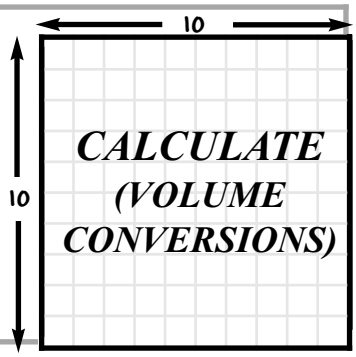
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Lesson 11

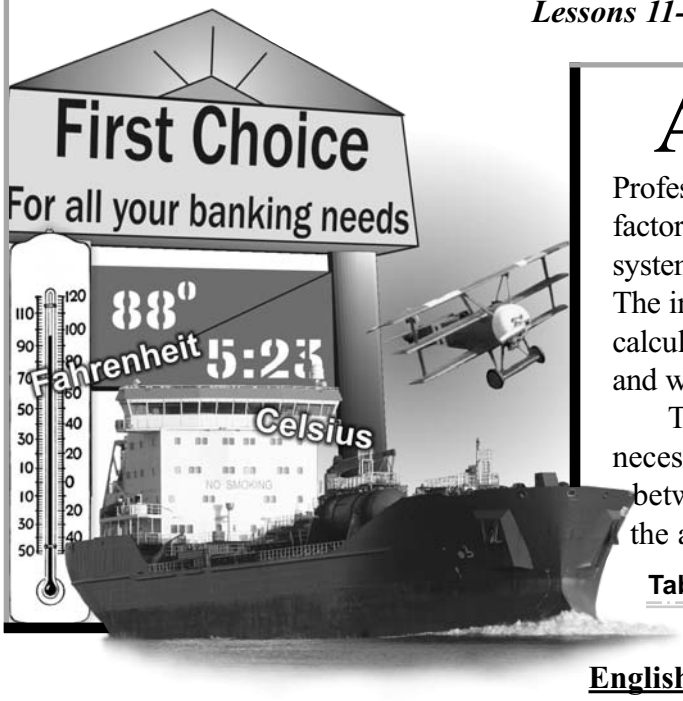
Chapter 6

Calculations



Section 3

Lessons 11-15



As was the case in Lessons 9 and 10 for conversion factors of *length* and *area*, Professor K shows more accurately the conversion factors for *volume* between the English and Metric systems of measurement contained in this lesson. The invention of calculators and computers made calculations of length and area quicker and easier, and with greater precision.

Table 11.1 gives the conversion factors necessary to convert *volume* measurements between the English and Metric Systems with the aid of a calculator.

Table 11.1

Volume

English System		Metric System
0.061024 cubic in.	=	Cubic centimeter
35.314667 cubic ft	=	Cubic meter (m^3)
Cubic inch	=	16.387064 cubic centimeters
Cubic foot;	=	0.028317 cubic meters;
7.480520 gal		28.31605 liters (*l*)
one ***gill***	=	23.656 milliliters (ml)
(4 gills = one pint)		

Table 11.1 shows the conversion factors for various measures of *volume* between the English and Metric systems of measurements. Look at **Example Set 1** with Professor K to see how to change the English System measurements for volume into the Metric System measurements.

Example Set 1

Timothy owned a model airplane that was powered by a small gasoline engine. Timothy went to the service station and picked up 3 gallons of gasoline. Timothy's model airplane could fly for one hour on 30 milliliters of gasoline. Calculate how many hours Timothy can fly his model airplane with the gasoline he purchased.

VOCABULARY

Gill: a unit of volume measurement in the English system of measurement equal to $\frac{1}{2}$ cup
Oil tanker: a sea-going ship designed to carry oil
Shipyard: a place, usually near an ocean or sea where ships are built

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Step 1 Refer to **Table 11.1** and the conversion chart at the end of this chapter to locate the conversion factors needed to perform the desired conversion and place the conversion factors properly in Step 2.

Step 2 Write out the conversions and then use a calculator to obtain the answer.

$$3\text{ gal} \bullet \frac{4\text{ qts}}{1\text{ gal}} \bullet \frac{2\text{ pts}}{1\text{ qt}} \bullet \frac{4\text{ gills}}{1\text{ pt}} \bullet \frac{23.656\text{ ml}}{1\text{ gill}} \bullet \frac{1\text{ hour}}{30\text{ ml}} =$$

$$\frac{3 \cancel{\text{ gal}} \bullet 4 \cancel{\text{ qts}} \bullet 2 \cancel{\text{ pts}} \bullet 4 \cancel{\text{ gills}} \bullet 23.656 \cancel{\text{ ml}} \bullet 1\text{ hour}}{1 \cancel{\text{ gal}} \bullet 1 \cancel{\text{ qt}} \bullet 1 \cancel{\text{ pt}} \bullet 1 \cancel{\text{ gill}} \bullet 30 \cancel{\text{ ml}}} = 75.6992\text{ hours}$$

Timothy can fly his model airplane for *75.7* hours (rounded to the nearest tenth of an hour). Professor K typed the following into his calculator to obtain the answer.

$$(3 \times 4 \times 2 \times 4 \times 23.656) \div (30) \quad \text{<ENTER>}$$

Notice in Step 2 that Professor K placed the unit conversions in such a manner as to divide them out. When setting up your mathematical conversion expression, make sure the units divide out like Professor K's did. This insures that you have placed each conversion properly.

Example Set 2

An ***oil tanker*** built at a ***shipyard*** in England contained a compartment 10 meters wide, 30 meters tall and 50 meters long. Help Professor K determine how many gallons of oil the tanker can transport if the tanker has two such compartments.

Step 1 The volume of the compartment must be calculated. The dimensions of the compartment are 10 m × 30 m × 50 m, therefore, the volume, $V = l \bullet w \bullet h =$ 10 m • 30 m • 50 m = 15,000 m^3 (cubic meters).

Step 2 Refer to **Table 11.1** and the conversions from Chapter 3 to locate the conversion factors needed to perform the desired conversion on the answer from Step 1, and place the conversion factors properly in Step 3.

Step 3 *Cubic meters* must be converted into *cubic feet* and then into *gallons*.

$$15{,}000\text{ m}^3 \bullet \frac{35.314667\text{ ft}^3}{1\text{ m}^3} \bullet \frac{7.480520\text{ gal}}{1\text{ ft}^3} =$$

$$\frac{15{,}000 \cancel{\text{ m}^3} \bullet 35.314667 \cancel{\text{ ft}^3} \bullet 7.480520\text{ gal}}{1 \cancel{\text{ m}^3} \bullet 1 \cancel{\text{ ft}^3}} = 3{,}962{,}581.092\text{ gals}$$



One compartment in the oil tanker will hold *3,962,581.092* gallons of oil and two compartments will hold *3,962,581.092* gallons • 2 = 7,925,162.184 gallons of oil.

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Professor K typed the following into his calculator to obtain the answer.

15000 × 35.314667 × 7.480520 <ENTER> × 2 <ENTER>

Apply what you have learned about conversions involving volume between the English and Metric Systems of measurements by working the activity for this lesson.

Life Principle



"You can't do anything about the length of your life, but you can do something about its width and depth."

—John Mason

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Basic Math Skills



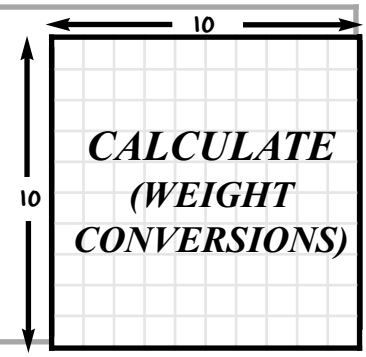
Lesson 12

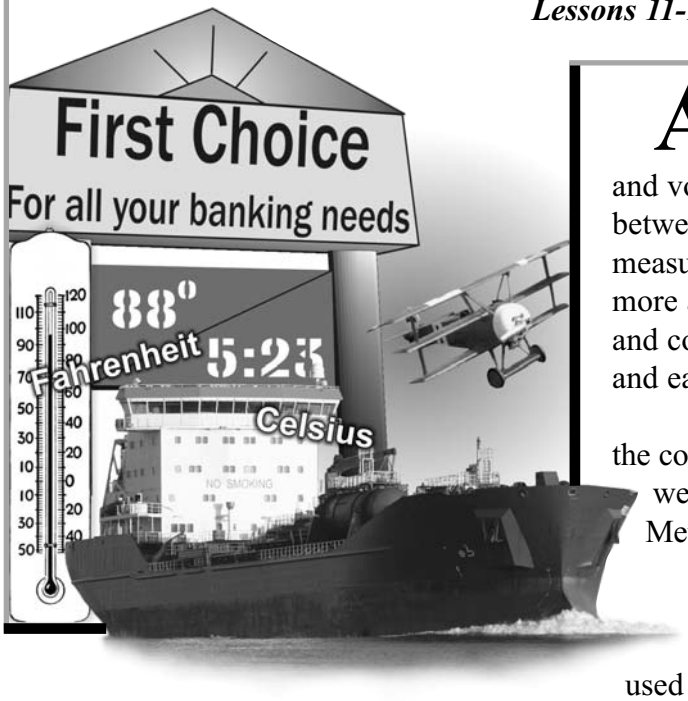
Chapter 6

Calculations

Section 3

Lessons 11-15





As was the case in Lesson 9, 10, and 11 for conversion factors for length, area and volume, the conversion factors for weight between the English and Metric Systems of measurement contained in this lesson, are shown more accurately. The invention of calculators and computers made precise calculations quicker and easier.

Professor K will show you in this lesson the conversion factors necessary to convert weight measurements between the English and Metric Systems with the aid of a calculator.

In **Table 12.1** Professor K shows the conversion factors for various weight measurements. These conversions are used in the examples that follow **Table 12.1**. Look at the examples to see how Professor K converts measurements of weight more precisely with a calculator.

Table 12.1

Weight		
one gill	=	4 ounces
one ounce (oz)	=	28.349523 ***grams*** (g)
one ***kilogram*** (kg)	=	2.204623 pounds
one pound	=	0.453592 kg *or* 453.59237 grams (g)
one ton	=	907.18474 kg

VOCABULARY

Gram: basic unit of weight in Metric System
Kilogram: 1000 grams
Capacity: volume; how much something will hold

Example Set 1

Timothy's model airplane from **Example Set 1** in the previous lesson will carry 400 grams of cargo and gasoline. The fuel tank on Timothy's model airplane holds 2.5 gills of fuel. Calculate the amount of weight ***capacity*** remaining for other cargo.

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Step 1 Use conversion factors from **Table 12.1** to determine the weight of 2.5 gills of gasoline in grams.

$$2.5 \text{ gills} \bullet \frac{4 \text{ oz}}{1 \text{ gill}} \bullet \frac{28.349523 \text{ grams}}{1 \text{ oz.}} =$$

$$\frac{2.5 \text{ gills} \bullet 4 \text{ oz} \bullet 28.349523 \text{ grams}}{1 \text{ gill} \bullet 1 \text{ oz}} = 283.49523 \text{ grams}$$

Professor K typed the following into his calculator to obtain the answer.

2.5 × 4 × 28.349523 <ENTER>

Step 2 The weight of the gasoline calculated in Step 1 as *283.49523 grams* must be subtracted from the total weight capacity of 400 grams. This yields the following mathematical statement: 400 grams - *283.49523 grams* = 116.50477 grams = 116.5 grams (rounded to the nearest tenth). The weight of other cargo that Timothy's model airplane can carry is 116.5 grams. Professor K typed the following into his calculator to obtain the answer.

400 - 283.49523 <ENTER>

Example Set 2

Together Timothy and his little brother weigh 85 kilograms. If Timothy weighs 110 pounds, calculate his little brother's weight in pounds.

Step 1 Refer to the conversions in **Table 12.1** and convert 85 kg into pounds.

$$85 \text{ kgs} \bullet \frac{2.204623 \text{ pounds}}{1 \text{ kg}} = 187.392955 \text{ pounds}$$

Professor K typed the following into his calculator to obtain the answer.

85 × 2.204623 <ENTER>

Step 2 Subtracting Timothy's weight, 110 pounds, from the weight of both boys combined, is 187.4 pounds (rounded to the nearest tenth). So then, 187.4 - 110 = 77.4 pounds. Timothy's little brother weighs 77.4 pounds. Professor K typed the following into his calculator to obtain the answer.

187.4 - 110 <ENTER>

Apply what you have learned about conversion involving weight between the English and Metric systems of measurements by working the activities for this lesson.



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Life Principle



"Commitment separates the doers from the dreamers."

—Anonymous

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Basic Math Skills



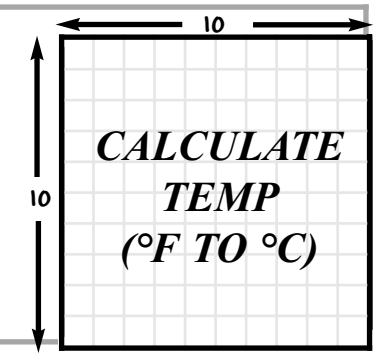
Lesson 13

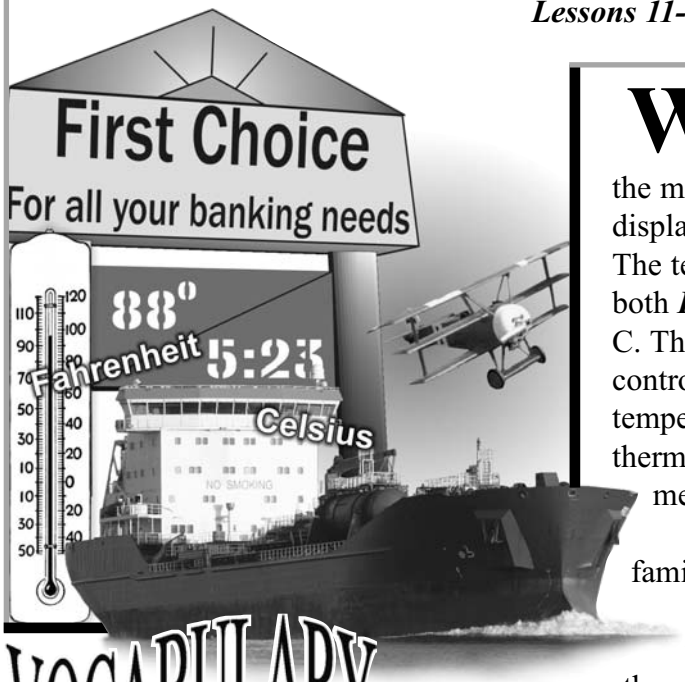
Chapter 6

Calculations

Section 3

Lessons 11-15







While driving to work each day, Professor K checks one of the many bank ***marquees*** that display the current temperature. The temperature may be given in both ***Fahrenheit***, F, and ***Celsius***, C. The computer in the bank that controls the marquee must convert the temperature reading from the bank's thermometer between the two units of measurement.

The average American citizen is more familiar with Fahrenheit units than with Celsius. Scientists use Celsius measurements because it is a standard in the scientific community all around the world. Celsius measurement is also much easier to understand and make calculations because the freezing point of water is at 0° and boiling point of water is at 100°.

Calculators make conversions between Fahrenheit and Celsius units easier and more accurate. In this lesson Professor K will show you how to convert Fahrenheit temperature units into Celsius temperature units using a scientific calculator.

VOCABULARY

Marquees: business signs that often consist of flashing lights and moving messages

Fahrenheit: the unit of temperature in the English system with 180 equal divisions between the freezing (32°) and boiling (212°) points of water

Celsius: the normal unit of temperature in the metric system with 100 equal divisions between the freezing (0°) and boiling (100°) points of water

Converting Fahrenheit to Celsius

To convert Fahrenheit readings into Celsius, the formula $C = \frac{5}{9}(F - 32)$ is used, where F is the temperature in degrees Fahrenheit, and C is the temperature in degrees Celsius.

Look at **Example Sets 1 and 2** and follow along with Professor K, using your scientific calculator to convert temperatures from Fahrenheit units into Celsius units of temperature.

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Example Set 1

Change 80°F into degrees Celsius.

Step 1 Write the conversion formula to change Fahrenheit into Celsius.

$C = \frac{5}{9}(F - 32)$

Step 2 Substitute 80 for the value of F into the formula.

$F = 80 \rightarrow C = \frac{5}{9}(80 - 32)$

Step 3 Type the following into the calculator:

$5 \div 9 \times (80 - 32)$

Then press the *enter* key to perform the operations.
The answer, *26.66666667* should appear on the screen of the calculator.

Step 4 Depending on the degree of accuracy desired, round the answer to the desired decimal place. Rounded to the nearest *hundredths* place, *80°F* is *26.67°C*.

Example Set 2

Convert 211°F to degrees Celsius.

Step 1 Write the conversion formula to change Fahrenheit into Celsius.

$C = \frac{5}{9}(F - 32)$

Step 2 Substitute 211 for the value of F into the formula.

$F = 211 \rightarrow C = \frac{5}{9}(211 - 32)$

Step 3 Type the following into the calculator.

$5 \div 9 \times (211 - 32)$

Then press the *enter* key to perform the operations.
The answer, *99.44444444* should appear on the screen of the calculator.

Step 4 Depending on the degree of accuracy desired, round the answer to the desired decimal place. Rounded to the nearest *hundredth* place, *211°F* is *99.44°C*.

Apply what Professor K has shown you about using a calculator to calculate Fahrenheit units of temperature into Celsius unit of temperatures by working the activities for this lesson.

Life Principle: "There is no part of life that does not contain its lessons. If you are alive, there are lessons to be learned."
—Chérie Carter-Scott in "The Rules for Being Human"



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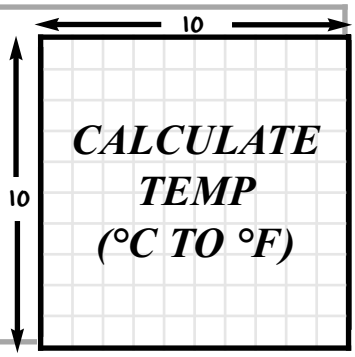
Lesson 14

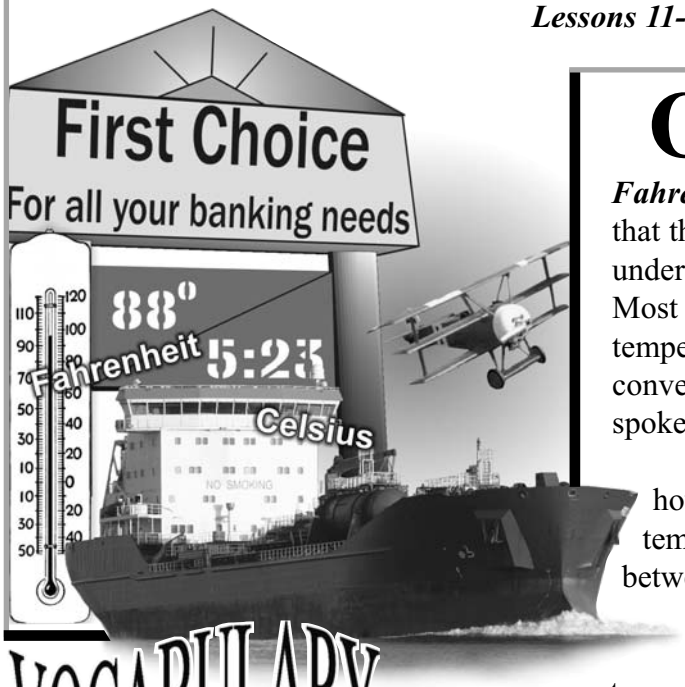
Chapter 6

Calculations

Section 3

Lessons 11-15





Often scientists must present temperatures to the public in ***Fahrenheit*** units instead of degrees ***Celsius*** so that the average American citizen can understand the temperature being discussed. Most of the world uses the Metric System for temperature, so Fahrenheit units may need to be converted to Celsius when temperatures are spoken of in other parts of the world.

Professor K will show you in this lesson how to convert Celsius units into Fahrenheit temperature units, as well as conversions between degrees Celsius and ***Kelvin***.

Look at **Example Sets 1 and 2** as Professor K converts Celsius temperatures into Fahrenheit temperatures. Be sure to follow along with Professor K using your scientific calculator for quick conversions.



Fahrenheit: (F) an English temperature system with 180 equal divisions between freezing (32°) and boiling (212°) points of water
Celsius: (C) a Metric temperature system with 100° equal divisions between freezing (0°) and boiling (100°) points of water
Kelvin: (K) an absolute unit of temperature in the metric system used only by scientists; has 100 equal divisions between freezing (273.16°) and boiling (373.16°) points of water

Convert Celsius to Fahrenheit

To convert Celsius readings into Fahrenheit, the formula $F = \frac{9}{5}C + 32$ is used, where F is the temperature in degrees Fahrenheit, and C is the temperature in degrees Celsius.

Example Set 1

Convert 0°C to degrees Fahrenheit.

Step 1 Write the conversion formula to convert Celsius into Fahrenheit.

$$F = \frac{9}{5}C + 32$$

Step 2 Substitute 0 for the value of C into the formula.

$$C = 0 \rightarrow F = \frac{9}{5}(0) + 32$$

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Step 3 Type the following into the calculator.

$9 \div 5 \bullet 0 + 32$

Then press the *enter* key to perform the operations.
The answer, *32* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 0°C = 32°F.

Example Set 2

Convert 50°C to degrees Fahrenheit.

Step 1 Write the conversion formula to convert Celsius into Fahrenheit.

$F = {}^{9}/_{5}C + 32$

Step 2 Substitute 50 for the value of C into the formula.

$C = 50 \rightarrow F = {}^{9}/_{5}(50) + 32$

Step 3 Type the following into the calculator.

$9 \div 5 \bullet 50 + 32$

Then press the *enter* key to perform the operations.
The answer, *122* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 50°C = 122°F.

Within the scientific community, Professor K knows that scientists have an absolute (never changing) standard of describing temperature. This standard is called *degrees Kelvin*. Scientists consider -273.16°C as *absolute zero*. *Absolute zero* is a point at which all motion within a molecule stops and everything freezes, not just water.

Converting Celsius to Kelvin

To convert Celsius temperatures into degrees Kelvin, add 273.16 to the Celsius temperature.

$K = 273.16 + C$

Example Sets 3 and 4 will show how Professor K converts temperatures into degrees Kelvin, *K*. Look at these examples and follow Professor K's calculations with your calculator.

Example Set 3

Convert 0°C to degrees Kelvin.



Step 1 Write the conversion formula to convert Celsius into Kelvin.

$K = 273.16 + C$

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Step 2 Substitute 0 for the value of C into the formula.

$C = 0 \rightarrow K = 273.16 + 0$

Step 3 Type the following into the calculator.

273.16 + 0

Then press the *enter* key to perform the operations.
The answer, *273.16* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 0°C = 273.16°K.

Example Set 4

Convert 90°C to degrees Kelvin.

Step 1 Write the conversion formula to convert Celsius into Kelvin.

$K = 273.16 + C$

Step 2 Substitute 90 for the value of C into the formula.

$C = 90 \rightarrow K = 273.16 + 90$

Step 3 Type the following into the calculator.

273.16 + 90

Then press the *enter* key to perform the operations.
The answer, *363.16* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 90°C = 363.16°K.

Often conversions must be made from degrees Kelvin to degrees Celsius. Look at the formula below and **Example Sets 5 and 6** to see how Professor K accomplishes this. Be sure to follow along and use your calculator to work the calculations in the examples.

Converting Kelvin to Celsius

To convert Kelvin temperatures into to degrees Celsius, subtract 273.16 from the Kelvin temperature.

$C = K - 273.16$

Example Set 5

Convert 100°K to degrees Celsius.

Step 1 Write the conversion formula to convert Kelvin into degrees Celsius.

$C = K - 273.16$

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Step 2 Substitute 100 for the value of K into the formula.

$K = 100 \rightarrow C = 100 - 273.16$

Step 3 Type the following into the calculator.

100 - 273.16

Then press the *enter* key to perform the operations.
The answer, *-173.16* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 100°K = -173.16°C.

Example Set 6

Convert 400°K to degrees Celsius.

Step 1 Write the conversion formula to convert Kelvin into degrees Celsius.

$C = K - 273.16$

Step 2 Substitute 400 for the value of K into the formula.

$K = 400 \rightarrow C = 400 - 273.16$

Step 3 Type the following into the calculator.

400 - 273.16

Then press the *enter* key to perform the operations.
The answer, *126.84* should appear on the screen of the calculator.

Step 4 In this example no rounding is necessary, as it can be seen that 400°K = 126.84°C.

Apply what you have learned about using a calculator to calculate conversions involving the different units of temperature, as Professor K has presented it, by working the activities for this lesson.

Life Principle



"Life consists of many absolutes. Truth is one of them."

—Anonymous

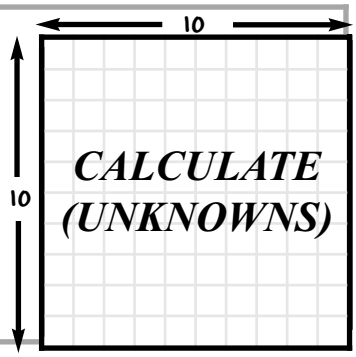
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Lesson 15

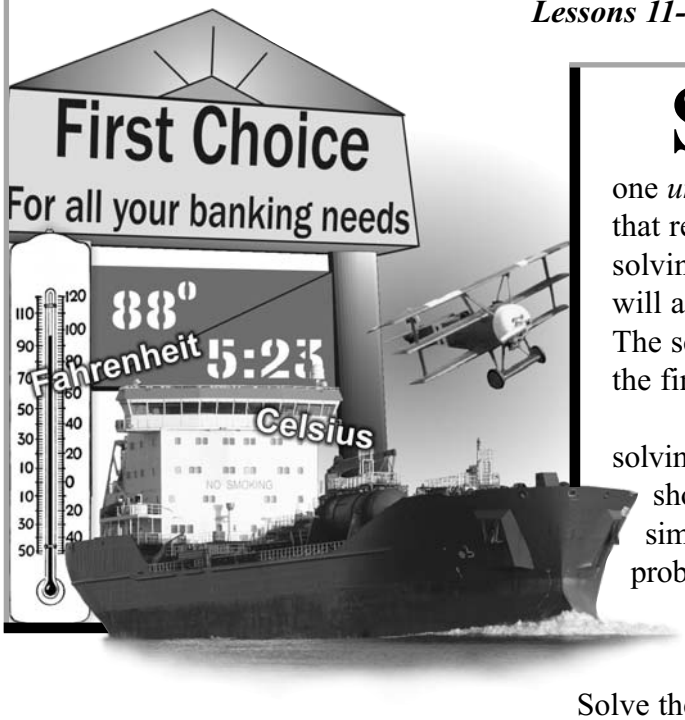
Chapter 6

Calculations



Section 3

Lessons 11-15



Scientific calculators simplify solving equations containing one *unknown*. Professor K points out that remembering the rules for solving equations with one *unknown* will aid your efforts in this lesson. The scientific calculator will make the final calculation of the solution much easier.



Professor K

Professor K will review the rules for solving equations containing one unknown and show you how to use a scientific calculator to simplify calculating the solution to the problem. Be sure to follow along with your calculator in the following examples.

Example Set 1

Solve the following equation for x.

$3.45x + 55.9 = 64$

Step 1 The x must be isolated on the lhs (left hand side) of the equals sign. To begin this process, Professor K must subtract 55.9 from both sides of the equation. (Remember, what is done to one side of the equation must be done to the other.)

$$3.45x + 55.9 - 55.9 = 64 - 55.9$$

The calculations can be made quicker and easier with a calculator. Therefore, type the following into the calculator.

$$64 - 55.9$$

Then press the *enter* key to perform the subtraction of the two numbers to obtain the difference of 8.1.

Step 2 This changes the equation to:

$$3.45x = 8.1$$

VOCABULARY

Increase: addition
Decrease: subtraction
Times: multiplication
the same as: equal to
Twice: two times

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Step 3

Professor K continues the process of isolating the x by dividing both sides of the equation by 3.45.

$$\frac{3.45x}{3.45} = \frac{8.1}{3.45}$$

The calculations can be made quicker and easier using a calculator, so type the following into the calculator.

$$8.1 \div 3.45$$

Then press the *enter* key to perform the division of the two numbers to obtain a quotient of *2.347826086*. Remember $3.45 \div 3.45 = 1$, therefore, the lhs is $1 \bullet x = x$.

Step 4

Professor K places these calculations into the equation to make the following equation: $x = 2.347826086$. Therefore, 2.347826086 is the solution to the original equation, $3.45x + 55.9 = 64$. Professor K puts the solution in proper form by placing it in solution set notation form. {2.347826086}

Example Set 2 is another example of solving an equation containing one *unknown*. Professor K uses this example to demonstrate changing the words of a stated problem into mathematical terms. Be sure to follow along with your calculator.

Example Set 2

Four ***times*** a number ***decreased*** by 5.25 is the same as ***twice*** the number ***increased*** by 9.3.

Step 1

The problem must be set up according to specific wording.

a) Four times a number would be $4 \bullet x$ or $4x$.
b) Decreased by 5.25 means subtraction.
c) Therefore the lhs of the equation is $4x - 5.25$.
d) The words, "is the same as" means "equal to" (=).
e) Twice the number means $2 \bullet x$ or $2x$.
f) Increased by 9.3 means addition.
g) Therefore, the rhs (right hand side) of the equation is $2x + 9.3$.

Putting the lhs with the rhs yields the equation:

$$4x - 5.25 = 2x + 9.3$$

Step 2

Professor K must isolate the x on the lhs of the equation. To begin this process, Professor K adds 5.25 to both sides of the equation as shown.

$$4x - 5.25 + 5.25 = 2x + 9.3 + 5.25$$

Professor K combines like terms by using the calculator ($5.25 - 5.25 = 0$ and $9.3 + 5.25 = 14.55$) yielding the following equation.

$$4x + 0 = 2x + 14.55 \rightarrow 4x = 2x + 14.55$$

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Step 3

To continue the process of isolating the x on the lhs, Professor K subtracts $2x$ from both sides of the equation as shown.

$$4x - 2x = 2x - 2x + 14.55$$

Professor K then combines *like terms* ($4x - 2x = 2x$ and $2x - 2x = 0$) yielding the following equation.

$$2x = 0 + 14.55 \rightarrow 2x = 14.55$$

Step 4

Professor K now divides both sides of the equation by 2 to complete the process of isolating the x on the lhs of the equation. Follow along using your calculator to perform the division.

$$\frac{2x}{2} = \frac{14.55}{2} \rightarrow 1 \bullet x = 7.275 \rightarrow x = 7.275$$

Therefore, *7.275* is the solution to the original equation, $4x - 5.25 = 2x + 9.3$. Professor K places the solution in solution set notation form.

$$\{7.275\}$$

Professor K encourages you to apply what you have learned about using a calculator to calculate solutions to equations containing one *unknown* by working the activities for this lesson.

Life Principle



"The only way to solve the unknowns in our lives is to put into the formula the absolutes we do know."

—N.S. Johnson

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Basic Math Skills

Mathematics Charts

LENGTH - ENGLISH SYSTEM

12 inches	=	1 foot
3 feet	=	1 yard
5.5 yards	=	1 rod
320 rods	=	1 mile
1,760 yards	=	1 mile
5,280 feet	=	1 mile

VOLUME - ENGLISH SYSTEM

1 tablespoon, Tbsp, T	=	3 teaspoons, tsp
1 cup, c	=	16 tablespoons, Tbsp, T
1 pint, pt	=	2 cups, c
1 quart, qt	=	2 pints, pts
1 gallon, gal	=	4 quarts, qts

WEIGHT - ENGLISH SYSTEM

1 pound, lb	=	16 ounces, oz
1 hundredweight, cwt	=	100 pounds, lbs
1 ton	=	20 hundredweight, cwt
1 ton	=	2000 pounds, lbs

LENGTH - METRIC SYSTEM

1 meter	=	1,000 millimeters
1 meter	=	100 centimeters
1 kilometer	=	1,000 meters
1 centimeter	=	10 millimeters

VOLUME - METRIC SYSTEM

1 liter	=	1,000 milliliters
1 liter	=	100 centiliters
1 kiloliter	=	1,000 liters
1 centiliter	=	10 milliliters

WEIGHT - METRIC SYSTEM

1 gram	=	1,000 milligrams
1 gram	=	100 centigrams
1 kilogram	=	1,000 grams
1 centigram	=	10 milligrams

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Mathematics Charts

PERFECT SQUARES

$\sqrt{1}=1$	$\sqrt{25}=5$	$\sqrt{81}=9$	$\sqrt{169}=13$
$\sqrt{4}=2$	$\sqrt{36}=6$	$\sqrt{100}=10$	$\sqrt{196}=14$
$\sqrt{9}=3$	$\sqrt{49}=7$	$\sqrt{121}=11$	$\sqrt{225}=15$
$\sqrt{16}=4$	$\sqrt{64}=8$	$\sqrt{144}=12$	$\sqrt{256}=16$

PERFECT CUBES

$\sqrt[3]{1}=1$	$\sqrt[3]{-8}=-2$	$\sqrt[3]{64}=4$	$\sqrt[3]{-125}=-5$
$\sqrt[3]{-1}=-1$	$\sqrt[3]{27}=3$	$\sqrt[3]{-64}=-4$	$\sqrt[3]{216}=6$
$\sqrt[3]{8}=2$	$\sqrt[3]{-27}=-3$	$\sqrt[3]{125}=5$	$\sqrt[3]{-216}=-6$

$$P = \frac{\text{the number of elements in the set containing favorable outcomes}}{\text{the number of elements in the sample set}}$$

$$Midpoint = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

FORMULAS

Surface Area	Area	Volume	Perimeter/ Circumference	Others
Sphere: $A_s = 4\pi r^2$	**Triangle:** $A = {}^1\!/_2 bh$	**Sphere:** $V = {}^4\!/_3 \pi r^3$	**Perimeter of a Rectangle:** $P = 2w + 2l$	**Pythagorean Theorem:** $c^2 = a^2 + b^2$
Cylinder: $A_s = 2\pi rh + 2\pi r^2$	**Rectangle:** $A = l \times w$	**Cone:** $V = {}^1\!/_3 \pi r^2 h$	**Circumference of a Circle:** $C = 2\pi r$ or $C = \pi d$	**Convert to Fahrenheit:** $F = {}^9\!/_5 C + 32$
Cube: $A_s = 6s^2$	**Circle:** $A = \pi r^2$	**Rectangular Prism:** $V = l \times w \times h$		**Convert to Celsius:** $C = {}^5\!/_9 (F - 32)$
Lateral Surface Area of a Cone: $A_{ls} = \pi rl$	**Trapezoid:** $A = {}^1\!/_2 (b_1 + b_2)h$	**Square Pyramid:** $V = ({}^1\!/_3) lwh$		**Distance:** $d = r \bullet t$
		Triangular Prism: $V = {}^1\!/_2 bhl$		**Slope:** $y = mx = b$
		Cylinder: $V = \pi r^2 h$		**Simple Interest:** $I = prt$

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Mathematics Charts

TIME CONVERSIONS

1 week = 7 days
1 year = 12 months

CONVERSIONS

English to Metric	
1 ounce (oz)	28.35 grams (g)
1 pound (lb)	454 grams (g)
1 ton (T)	907.2 kilograms (kg)

Metric to English	
1 gram (g)	.035 ounce (oz)
1 kilogram (kg)	2.2 pounds (lb)
1 metric ton (mt)	2200 pounds (lb)

English to Metric	
1 cubic inch	16.39 cubic cm
1 gallon	3.785 liters
1 cubic foot	28.316 liters
1 quart	.946 liters

Metric to English	
1 cubic cm	.061 cubic inch
1 cubic meter	35.315 cubic feet
1 liter	1.05 quarts
1 liter	.264 gallon

English to Metric	
1 inch	2.54 cm
1 foot	0.3048 meter
1 yard	0.9144 meter
1 mile	1.6 km

Metric to English	
1 centimeter	0.3937 in.
1 meter	39.37 in.
1 meter	1.09 yds
1 kilometer	0.6213 mile

AREA CONVERSIONS

1 square centimeter = 0.155000 sq in.
1 square meter = 10.763910 sq ft
1 square inch = 645.16 sq mm
1 square foot = 0.09290304 sq meter
1 square yard = 0.836127 sq meter
1 square foot = 144 sq in.

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