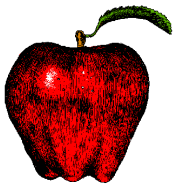


Learning About Nutrition
Using the TI-73 and the Web

Students in the middle grades need to be exposed to real world problems which show the appropriate use of the math they "see" in school. In order to provide student with these types of problems, teachers and students need to know some information about different subjects. Therefore, this module starts off with a "Warm Up!" The warm up takes teachers and students to web pages that will expose them to The Food Pyramid, Nutrition Labels and more. Next, a Nutrition Label from a deep dish pizza will be analyzed using fractions, decimals and percent. The information will be tabulated on the TI-73 using the LIST features. The information will also be displayed using pie charts on the TI-73. Students will compare what they eat with the Recommended Daily Value from the Food and Drug Administration. The final activity has students create breakfast, lunch and dinner from fast food information on the web. They will again analyze the energy value of the food and compare it with the Recommended Daily Value from the Food and Drug Administration. Finally, a TI-73 program is provided to automatically analyze their meals for further discussion of their nutritional habits.

Concepts:
- Fractions; Percent; Representation of data using pie charts.
- Calculator skills: Category Lists, TEXT, LIST, STAT, PLOT, PRGM

Materials:
- TI-73 Calculators
- This module is on the web at http://mason.gmu.edu/~mmankus/nutrition/1intro.htm in HTML and PDF formats.
- Low Tech*: Use nutrition labels from various foods and from fast food restaurants.

Activities:
1. Warm Up! Getting Familiar with the Vocabulary of Nutrition
2. Let's Eat Pizza - Analyze the Nutrition Label for a Deep Dish Pizza!
   Part 1: Let's Eat Pizza!
   Part 2: Analyze a Slice of Pizza Through the Eyes of the TI-73
3. Drive Thru Breakfast, Lunch and Dinner! What Nutrients Energize You!

Teacher Notes:*
Activity 1 web information is given at the end of the module for the low tech activity.

Other Web Resources:
- Kids Food Cyber Club, http://www.kidsfood.org/ has nice activities. These are geared to K-5 but they have a nice getting started on Internet searches and keeping track of your food activities.
- Introduction to the Food Industry, http://www.ift.org/car/food_ind/intro.html. (lesson plans)
- Food and Drug Administration Home Page, http://www.fda.gov/default.htm

Activity 1: Warm Up!
Getting Familiar with the Vocabulary of Nutrition

In order to do this investigation into nutrition, we need to know about several topics listed below. Go to each web page to learn about the various topics. You will want to go back to these pages as we do the activity. Write answers to the bulleted questions below either in your word processors or by hand.

I. The Food Pyramid
http://www.nal.usda.gov:8001/py/pmap.htm
1. How many food groups are in the pyramid?
2. Make a table listing the food groups and give the recommended number of servings for each group.

II. Nutrients
http://www.ift.org/car/food_ind/mod4.html#nutrition
1. List the 6 categories of nutrients.
2. Which of these nutrients in food provide energy to our bodies?

III. Nutrition Food Labels
http://www.fda.gov/fdac/special/foodlabel/facts.html

Write a summary of the Dietary Components from the Nutrition Facts on Nutrition Food Labels.

IV. 'Daily Values' Encourage Healthy Diet
http://www.fda.gov/fdac/special/foodlabel/dvs.html
1. Write a sentence describing each of the following, DVs (Daily Values), DRVs (Daily Reference Values), RDIs (Reference Daily Intakes), and RDAs (Recommended Dietary Allowances).
2. Write a description of how the DRV for energy producing nutrients are calculated.

V. Counting Calories (PDF file)
http://www.fda.gov/fdac/graphics/foodlabelspecial/pg44.pdf

Given the DRV, if your calorie intake is 2000 calories, find the grams of fat, carbohydrate and protein that should be in your daily intake. (Hint: You need to find out the number of calories per gram for each energy producing nutrient. Look back at the Nutrition Food Labels. Check the bottom of the label given!) You need this information for Activity 2 and Activity 3.

Activity 2: Part 1: Let's Eat Pizza!

You know that if you don't eat, you won't have an energy! If you don't eat, you just don't feel well! Our bodies need fuel just like a car needs to be filled with gasoline in order to run. We saw in Activity 1 that Fats, Carbohydrate, and Protein supply energy to your body. You decide for dinner that you would like to have one or maybe two pieces of pizza. What fuel are you giving your body? Here is the Nutrition Label from a deep dish pizza. How do we interpret this information?

Nutrition Facts

Serving Size 1/6 Pizza (130g)
Servings Per Container 6

Amount Per Serving	
Calories 320 Calories from Fat 110	
	% Daily Value*
Total Fat 13g	**19%**
Saturated Fat 6g	**29%**
Cholesterol 25mg	**8%**
Sodium 690mg	**29%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 2g	**6%**
Sugars 3g	
Protein 16g	
Vitamin A 8% ! Vitamin C 0%	
Calcium 25% ! Iron 15%	

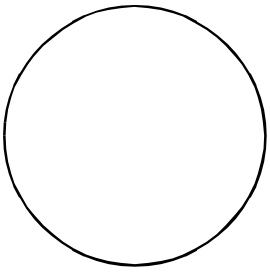
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 ! Carbohydrate 4 ! Protein 4

In the Warm Up Activity, you found that the Food and Drug Administration, FDA, has set up guidelines for eating for health. We are going to follow the energy nutrients, fats, carbohydrate, and protein. Notice that there are more categories listed on the label.

1. If we are going to use the information on the label, we need to know how much food the label is describing. What is the serving size given on the label? The pizza is circular. Draw one serving size.



2. Copy the table below on your paper. Fill in columns A and B. Use the Nutrition Label to find the information.

	A	B	C	D	E
	Pizza (g)	Calories/gram	Pizza Calories	Recommended Daily Calories	Calories Left for the Day
Fat					
Carbohydrate					
Protein					

Table 1

3. Using the information in column A and B, calculate the Pizza Calories for each energy nutrient. What operation did you use? Write the math! Write an explanation of what you computed on your own paper.

4. We are going to assume that we should eat 2000 Calories per day. (Please check with Counting Calories (PDF file): http://www.fda.gov/fdac/graphics/foodlabelspecial/pg44.pdf to see what is recommended for you!) The FDA recommends the following percentages for the breakdown of a 2000 Calorie eating plan.

30% - Fat 60% - Carbohydrate 10% - Protein

Using this information fill in column D. Write the math! Write an explanation of how you did the calculations.

5. What columns can you used to fill in column E? Write an explanation of what you did.

6. What are we going to investigate? The FDA says that you should pick your calories for the day using the following breakdown.

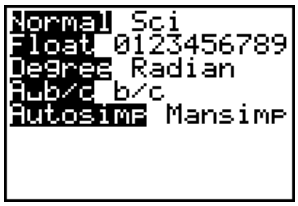
30% - Fat 60% - Carbohydrate 10% - Protein

Is the food you eat balanced in this way? Let's investigate.

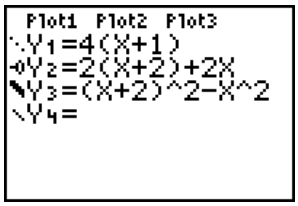
Note: All of the addition, subtractions, multiplications, and divisions in this investigation should be done by hand. They are very doable by hand. You will notice that many results are rounded. We will use the TI-73 to collect the data in list so that later, when we analyze an entire meal, we will not have to do many calculations by hand! Let's get started!

Activity 2: Part 2: Analyze a Slice of Pizza Through the Eyes of the TI-73

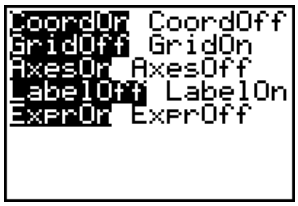
Setting up your TI-73:
These instructions should be followed each time you start an activity in your TI-73.



1. **Setting MODE:** Press MODE. To select an option, arrow to each option and press ENTER to highlight.

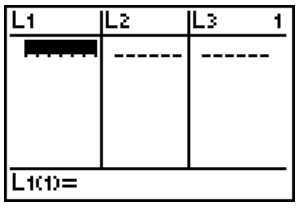


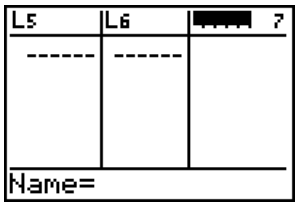
2. **Turning off Graphs and Plots:** Press Y=. If you see and equal signs or Plots highlighted, arrow to the highlighted area and press ENTER to turn off graphs and plots.



3. **Setting the Graphing Window Format:** Press 2nd FORMAT and make your screen look like the one shown. You might want to choose other options.

We have to keep track of three nutrients, Fat, Carbohydrate, and Protein. We will create a **Category List** on the TI-73.

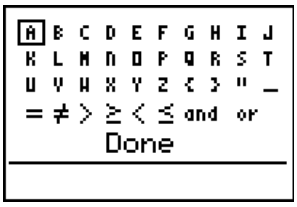


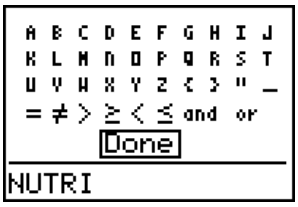


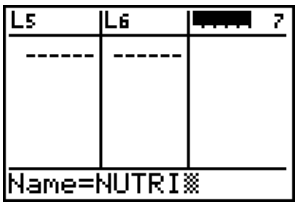
4. Press LIST. Arrow up to the list names and then arrow over until you get to a blank list. Notice that the small number 7 on the second screen indicates you are in the 7th column.

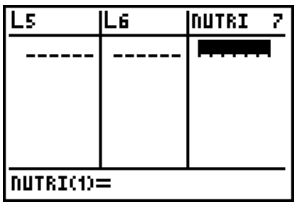
Note: Your list editor might not look like these screens. This can cause confusion in a class. From the home screen, you could press 2nd CATALOG, go to SetUpEditor, press ENTER and then ENTER. Press LIST to get back into the list editor.

5. Press 2nd TEXT. Let's name the list NUTRI. Arrow to each letter, press ENTER, and final arrow to Done when you are finished. The screens are shown in sequence below.

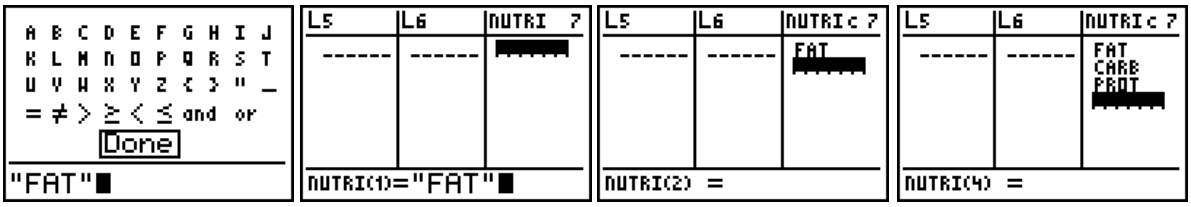




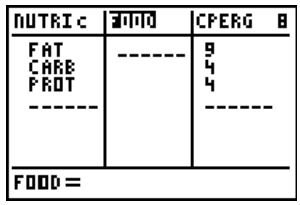


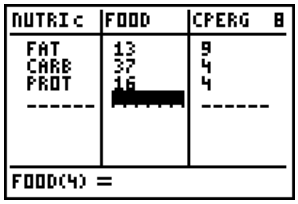


6. **Defining a Category List:** Press 2nd TEXT. To name the first element of the list "FAT" we need to use " marks around the name to tell the TI-73 that this is a category list. You only have to use " marks for the first entry. After you finish "FAT" press ENTER ENTER. Notice that there is a c in the list. This indicates a Category List. Follow the screens below. Repeat this to fill in the entries CARB and PROT.



Classroom Note: *Everyone should learn how to enter lists. To save time for the next lists, the instructor could have the list on their calculator and then link and send the lists to the students. (See Guidebook for instructions.)*



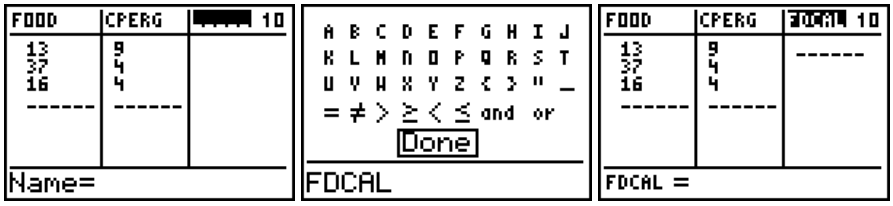


7. Create a list called FOOD and a list called CPERG (Cal/gram). The Calories per gram are given at the bottom of the Nutrition Label. Enter these values in CPERG as shown.

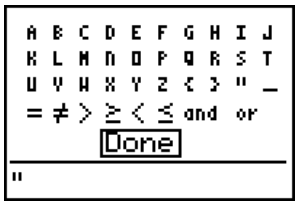
	Calories per gram:
Fat	9 C/g
Carbohydrate	4 C/g
Protein	4 C/g

8. Next, enter the number of GRAMS for each category in FOOD. Get this information from the Nutrition Label.

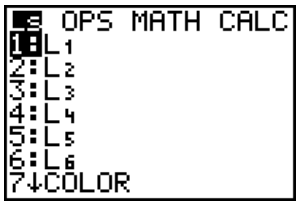
9. Highlight a list name and arrow over to an empty list. Name the list FDCAL for food calories.



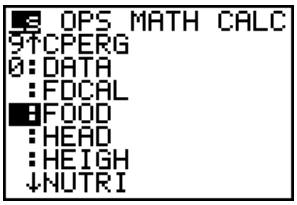
10. In Table 1, you calculated the pizza calories by multiplying the grams of a nutrient by the Calories per gram. The next screen take you through entering a **locked list**. We will set up the FDCAL = "FOOD*CPERG" The quote marks lock the list. Notice the small diamond that appears next to the FDCAL name. Now, any time you change FOOD, this list will update.



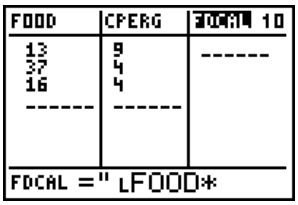
2nd TEXT.



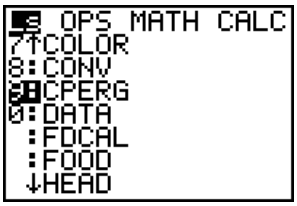
Press ENTER



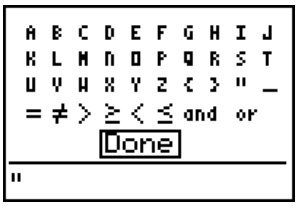
2nd LIST



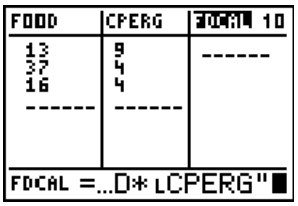
Arrow to name, ENTER
Press ×



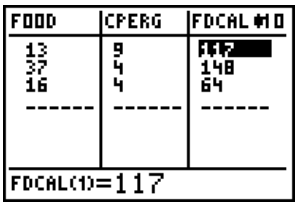
2nd LIST, ENTER.



2nd TEXT, ENTER.

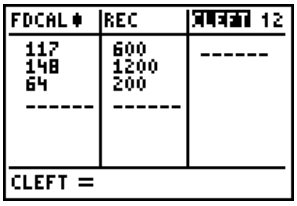


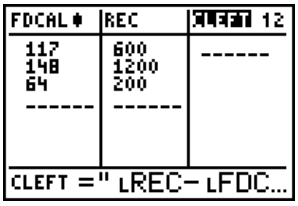
ENTER

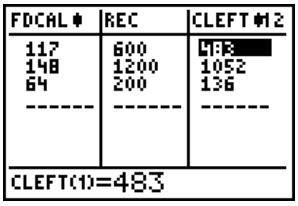


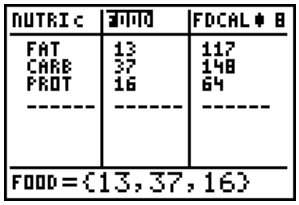
FDCAL is locked!

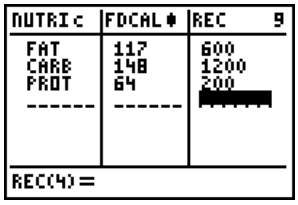
11. Next, repeat this procedure using the information above to enter CLEFT (Calories left to eat). Create the locked list CLEFT = "REC-FDCAL" Notice the small L that appears when a list name is pulled up! This is our final column from Table 1. WHEW!!!











12. To organize the lists so that you can see the lists you want to compare, just delete some lists from the editor. This will not delete the list. This just deletes the list from being seen in the editor! We just want to compare the nutrients through a comparison of calories. Highlight the list name FOOD and press DEL. Highlight the list name CPERG and press DEL. You should only see NUTRI, FDCAL, REC.

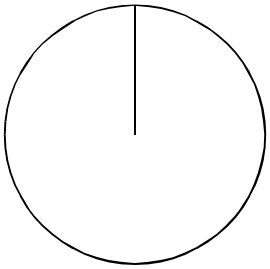
13. We get a better picture of the numbers if we change the number to percent of the total Calories. You can do this in the list editor but we need to first know what math we would like to "do" before we can set up lists. Copy and fill in the table below with the % of total Calories. Write an explanation of how you filled out columns B and D. Also explain the Totals.

	A	B	C	D
	Pizza	% of Total Pizza Calories	Recommended Daily Intake	% of Total Recommended Calories
Fat	117		600	
Carbohydrate	148		1200	
Protein	64		200	
Totals				

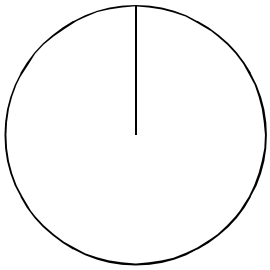
14. If you eat pizza all day, how many pieces can you eat and still stay within the FDA recommendations? Write out your answer using sentences and numbers.

15. Draw a pie chart for the piece of pizza and for the FDA recommendations.

Pizza

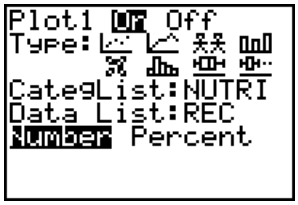


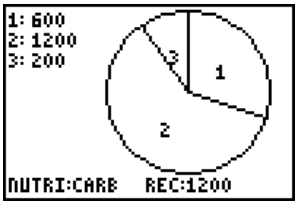
FDA Recommendation



16. **Setting Up Pie Charts:** It might be hard to see if the calories in a slice of pizza are in the same balance as the recommended calories for the day. We can use pie charts or circle graphs to see how the Calories of the nutrients in the pizza compare to the Calories of the nutrients recommended for the entire day. We see that representing the numbers as the percent of the total helps! If we want to analyze an entire day of food, calculating and drawing many circle graphs is not efficient! Let's have the TI-73 do the job!

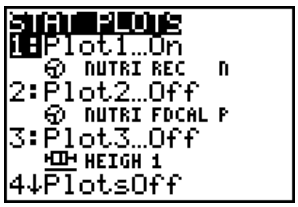
17. First, draw the circle graph for the FDA Recommendations:
Hint: Use 2nd STAT to find the list names.

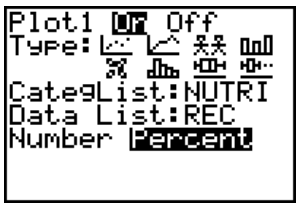


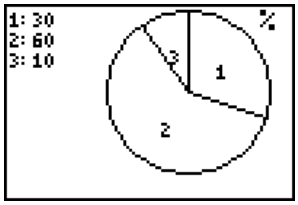


2nd PLOT Press 1: Plot1 Press GRAPH, then TRACE and arrow around!

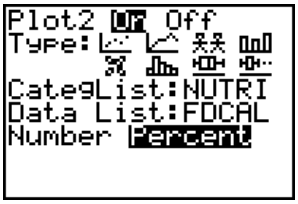
We would like to compare the percentage so we need to redraw this circle with the percent option. Notice you go through the same keystrokes as above except you set the option of Percent!

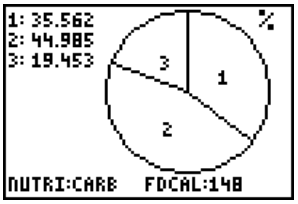






18. Now set up the pie chart for the slice of pizza. Press TRACE to see the three nutrients!





19. Do these graphs agree with your graphs? Can you eat pizza all day? Write your thoughts and support your decision using math!

Extension Questions:

- Read the pizza label and write an explanation of the numbers 19% in the Total Fat row and 12% in the Total Carbohydrate row.

- Look at the row on the Nutrition Label containing Protein. What percent should be in the % Daily Value column? Hint: You need to use the facts about the Calories per gram for each nutrient and you need to remember that the FDA recommends the following percentages for the breakdown of a 2000 Calorie eating plan.

  30% - Fat 60% - Carbohydrate 10% - Protein

- Someone added up the % Daily Value for Fat, Carbohydrate and Protein. It does not add to 100%! Try it! Explain why.

- Write out all details for drawing a pie chart by hand. Include the use of a protractor. Should we know how to draw pie charts by hand?

- Display the information using Bar Charts on the TI-73. How does this compare to using pie charts?

Congratulations! You are now ready to plan your meals for the day! Go to Activity 3!

Activity 3: Drive Thru Breakfast, Lunch and Dinner!
What Nutrients Energize You?

You are going for a trip on the web to plan out your meals for the day! You need to keep track of the energy nutrients. Be very careful to write down how many servings you are going to eat. After you plan your Breakfast, Lunch and Dinner, analyze your daily intake and compare it to the FDA recommendations.

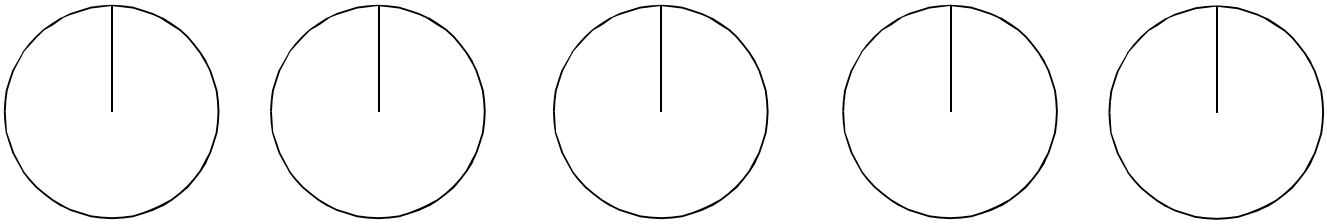
Sites to Visit - Fill in the tables on the next page!

- McDonald's® at http://www.mcdonalds.com/countries/usa/food/nutrition_facts/index.html
- Subway® Sandwiches at http://www.subway.com/our_food/nguide/usa/index.html
- Wendy's® at http://www.wendys.com/the_menu/nut_frame.html
- Taco Bell® at http://www.tacobell.com/homepage/default2.asp
  You need to go to Amaze Your Friend to get to the nutrition page.
  On the Nutrition Page, click in between the lines to get to the information.
- Burger King® at http://www.burgerking.com/home.htm
  Click on Nutrition to take their tour.
  They will total your menu!
- Pizza Hut® at http://www.pizzahut.com/nutrition98/default.htm
- Find your own! Use a search engine to look up your favorite restaurant.

Questions for the Activity:

1. Analyze your Breakfast, Lunch and Dinner separately. Which meals are within the recommendations? Which meal is heavier in fat, carbohydrate, and protein? Do you think that the total for the day will be withing the FDA recommendations?

2. After you plan you three meals, draw the pie chart for your food intake for the three meals and the FDA recommended daily intake. Are you within the recommendations? Draw the graphs here and write the percentage from each nutrient in each region.



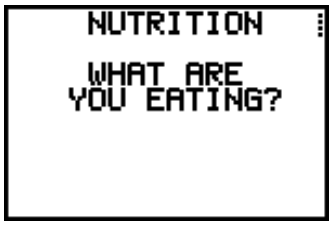
Breakfast Lunch Dinner Daily Total FDA

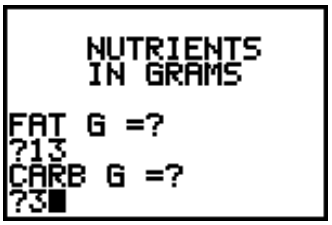
3. If you are not within the recommendations, try changing three foods during the day to see if you can get in line with the recommendation. Write the changes you make. After you try to change your meals once, go to the next problem and use the TI-73 program NUTRITIO.

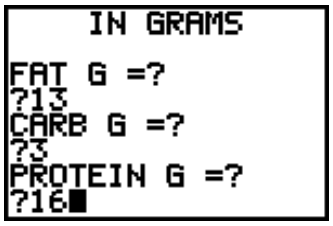
4. Enter and run the TI-73 program NUTRITIO to quickly do the above work. Remember that all of the steps you just did to calculate your circle graphs is being done in much the same way when you use this program. See the TI-73 Guidebook for details on entering and running a program.

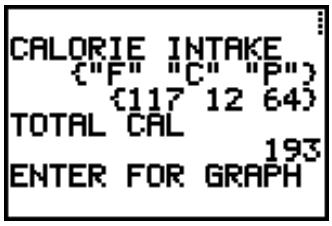
```
Prgm: NUTRITIO
ClrScreen
Disp "    NUTRITION"
Disp ""
Disp "    WHAT ARE"
Disp "   YOU EATING?"
Pause
ClrScreen
Disp ""
Disp "    NUTRIENTS"
Disp "    IN GRAMS"
Disp ""
Disp "FAT G =?"
Input L,(1)
Disp "CARB G =?"
Input L,(2)
Disp "PROTEIN G =?"
Input L,(3)
{"F","C","P"}üL„
{"FAT","CARB","PROT"}üL•
L,*{9,4,4}üLƒ
ClrScreen
Disp ""
Disp "CALORIE INTAKE"
Disp L„
Disp Lƒ
Disp "TOTAL CAL"
Disp sum(Lƒ)
Disp "ENTER FOR GRAPH"
Pause
PlotsOff
FnOff
Plot1(PiePlot,L•,Lƒ,1)
ZoomStat
Pause
```

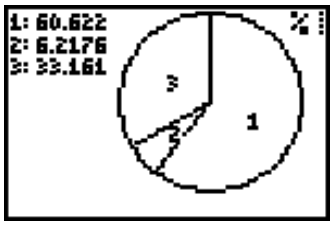
You will be asked to input the grams for each nutrient. Here is what you will see!











Drive Thru Breakfast, Lunch and Dinner!

Breakfast

Food	Fat grams	Carbohydrate grams	Protein grams
Totals			

Lunch

Food	Fat grams	Carbohydrate grams	Protein grams
Totals			

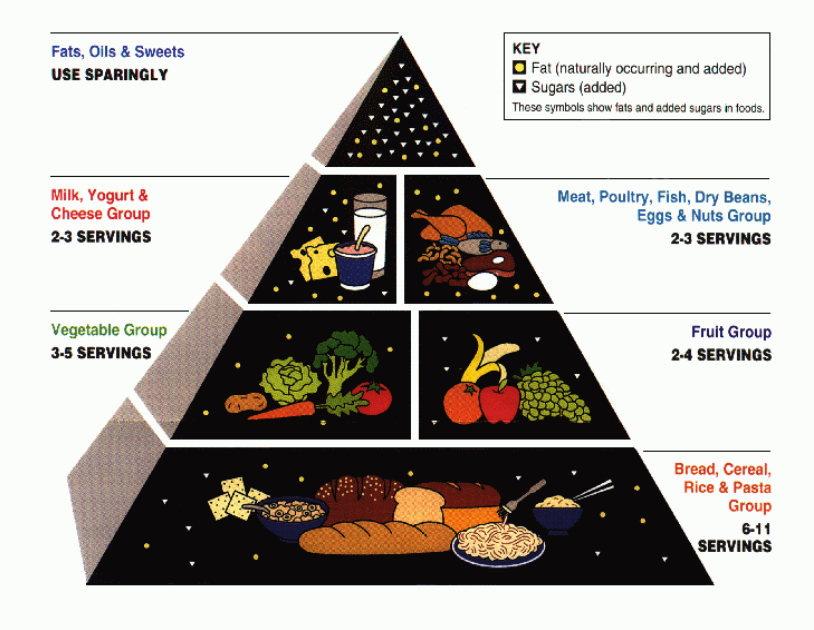
Dinner

Food	Fat grams	Carbohydrate grams	Protein grams
Totals			

Teachers Notes on Activity 1: Warm Up!

I. The Food Pyramid

1. How many food groups are in the pyramid?
2. Make a table listing the food groups and give the recommended number of servings for each group.



II. Nutrition (Taken from http://www.ift.org/car/food_ind/mod4.html#nutrition)

1. List the 6 categories of nutrients.
2. Which of these nutrients in food provide energy to our bodies?

Do you know which foods you should eat to help you stay healthy? Do you know how to read a food label to help you choose the healthiest food products in the supermarket? Nutrition is the process by which the foods we eat provide the nutrients we need to grow and stay healthy. Nutrients are naturally occurring chemical substances found in food. There are six categories of nutrients: proteins, lipids, carbohydrates, vitamins, minerals and water.

Proteins contain amino acids, sometimes referred to as the building blocks of protein. Dietary protein is supplied from plant and animal sources. Proteins are needed to build and repair body tissue and for the metabolic functions of our bodies.

Lipids include fats and oils from plants and animals. Cholesterol is a fat found only in animal products. Lipids are of special interest because they are linked to the development of heart disease, the leading cause of death among Americans.

The **carbohydrates** in our diet come from plant foods. Simple carbohydrates include the different forms of sugar, while complex carbohydrates include starches and dietary fiber.

Vitamins are chemical compounds in our food that are needed in very small amounts (in milligrams and micrograms) to regulate the chemical reactions in our bodies.

Minerals, also needed only in small amounts, have many different functions. Some minerals assist in the body's chemical reactions and others help form body structures.

Fifty to sixty percent of our body weight consists of **water**. It is the substance in which the metabolic reactions occur. We need about two quarts (2 liters) of water every day.

Protein, fats and carbohydrates in food provide the energy, or kilocalories (kcals), our bodies need to function. Each gram of protein and carbohydrate has 4 kilocalories; each gram of fat has 9. You might have noticed that we use the metric system - grams, milligrams and micrograms - to measure the amounts of nutrients in foods.
Note: 1 kilocalorie = 1 Calorie

III. Nutrition Food Labels

Write a summary of the Dietary Components from the Nutrition Facts on Nutrition Food Labels.

Dietary Components (from http://www.fda.gov/fdac/special/foodlabel/facts.html)
What can consumers expect? First, they will see a new name for the nutrition panel. It used to go by "Nutrition Information Per Serving." Now, it will be called "Nutrition Facts." That title will signal to consumers that the product is newly labeled according to FDA and FSIS' new regulations.

The new panel will be built around a new set of dietary components. The mandatory (boldfaced) and voluntary dietary components and order in which they must appear are:

- total calories
- calories from fat
- calories from saturated fat
- total fat
- saturated fat
- stearic acid (on meat and poultry products only)
- polyunsaturated fat
- monounsaturated fat
- cholesterol
- sodium
- potassium
- total carbohydrate
- dietary fiber
- soluble fiber
- insoluble fiber
- sugars
- sugar alcohol (for example, the sugar substitutes xylitol, mannitol and sorbitol)
- other carbohydrate (the difference between total carbohydrate and the sum of dietary fiber, sugars, and sugar alcohol, if declared)
- protein
- vitamin A
- percent of vitamin A present as beta-carotene
- vitamin C
- calcium
- iron
- other essential vitamins and minerals.

IV. 'Daily Values' Encourage Healthy Diet (from http://www.fda.gov/fdac/special/foodlabel/dvs.html)

1. Write a sentence describing each of the following, DVs, DRVs, RDIs, and RDAs.
2. Write a description of how the DRV for energy producing nutrients are calculated.

DVs (Daily Values): a new dietary reference term that will appear on the food label. It is made up of two sets of references, DRVs and RDIs.

DRVs (Daily Reference Values): a set of dietary references that applies to fat, saturated fat, cholesterol, carbohydrate, protein, fiber, sodium, and potassium.

RDIs (Reference Daily Intakes): a set of dietary references based on the Recommended Dietary Allowances for essential vitamins and minerals and, in selected groups, protein. The name "RDI" replaces the term "U.S. RDA."

RDAs (Recommended Dietary Allowances): a set of estimated nutrient allowances established by the National Academy of Sciences. It is updated periodically to reflect current scientific knowledge.

DRVs

DRVs for the energy-producing nutrients (fat, carbohydrate, protein, and fiber) are based on the number of calories consumed per day. For labeling purposes, 2,000 calories has been established as the reference for calculating percent Daily Values. This level was chosen, in part, because many health experts say it approximates the maintenance calorie requirements of the group most often targeted for weight reduction: postmenopausal women.

Also, unlike the 2,350-calorie reference that FDA used in its proposal, 2,000 calories is a rounded number, which makes it easier for consumers to calculate their individual nutrient needs.

The label will include--at least on larger packages--a footnote on the nutrition panel in which daily values for selected nutrients for both a 2,000- and a 2,500-calorie diet are listed. Manufacturers have the option of listing daily values for other calorie levels, if label space allows and as long as the Daily Values for the other two levels are listed, too.

Whatever the calorie level, DRVs for the energy-producing nutrients are always calculated as follows:

1. fat based on 30 percent of calories
2. saturated fat based on 10 percent of calories
3. carbohydrate based on 60 percent of calories
4. protein based on 10 percent of calories. (The DRV for protein applies only to adults and children over 4. RDIs for protein for special groups have been established.)
5. fiber based on 11.5 g of fiber per 1,000 calories.

Thus, someone who consumes 3,000 calories a day--a teenage boy, for example--would have a recommended intake for fat of 100 g or less per day. [0.30 times 3,000 = 900; 900 (calories) divided by 9 (calories per g of fat) = 100 g]. See the Counting Calories chart (34K PDF file) for an illustration of how to apply the nutrition label information to your individual needs.

V. Counting Calories (PDF file)

(from http://www.fda.gov/fdac/graphics/foodlabelspecial/pg44.pdf)

Given the DRV, if your calorie intake is 2000 Calories, find the grams of fat, carbohydrate and protein that should be in your daily intake. (Hint: You need to find out the number of calories per gram for each energy producing nutrient. Look back at the Nutrition Food Labels. Check the bottom of the label given!)

From the previous question,
2000 Calories × .30 = 600 Calories from Fat
2000 Calories × .60 = 1200 Calories from Carbohydrates
2000 Calories × .10 = 200 Calories from Protein

Calories per gram:		**Calculation:**
Fat	9 C/g	600 Calories ÷ 9 C/g about 67 g* of Fat
Carbohydrate	4 C/g	1200 Calories ÷ 4 C/g = 300 g of Carbohydrate
Protein	4 C/g	300 Calories ÷ 4 C/g = 75 g of Protein

* Notice that the Nutrition Labels use about 65 g of Fat for a 2000 Calorie diet.