

# What's My Temperature?

Math / Biology / General Science  
Middle / High  
Math Modeling / Data Collection

**Introduction:** A person's body temperature is a result of the release of energy due to the chemical reactions that occur in each living cell of your body. The given accepted value for a healthy body temperature is 37 degrees Celsius (98.6 degrees F). However, this is really an average of many people's body temperature. The actual range is 36.2 to 37.5 degrees Celsius. This activity will allow you to compare your body temperature to that of the accepted value.

You will collect temperature data by using the CASIO EA-100 DATA COLLECTOR (CDA) and transfer that data to the CASIO CFX-9850G Color Graphing Calculator, or the FX-7400G Mini Graphing Calculator. It will also detail how expand this activity to include a group activity in which a comparison of the data collected can be collected can be made and graphed.

**Objectives:** Students will be able to...

1. Collect data by following an experimental procedure.
2. Input data in a graphing calculator.
3. Compare results.
4. Draw conclusions.
5. Make predictions.
6. Discuss the biology of body temperature

**Related Key Words:**

warm blooded	cold-blooded	hypothermia
Metabolism	metabolic rate	heat stroke
Celsius scale	Fahrenheit scale	Kelvin scale

**Materials:**

- 1 CASIO CFX-9850G or FX-7400 Graphing Calculator
- 1 CASIO EA-100 CASIO Data Collector (CDA)
- 1 Temperature Probe (Included with the CDA)
- 1 Link Cord (Included with the CDA)

**Purpose:** To collect and record temperature data from one person and graph the results.

**STEP 1—** With the CDA turned off, insert the Temperature probe into the Channel One port on the top of the CDA and turn on the CDA.

**STEP 2--** Press the Yellow SHIFT key followed by the mode key on the CDA. This enables you to set up the parameters of the experiment. The first thing that appears is a choice to set the time between when the data points can be collected. To view these different times press the DATALOG key to scroll through the times; these range from 10 msec to 60 seconds. There is also a choice of .000, this allows you to record a data point whenever you press the trigger key, and this is not dependent on time. Set this parameter for 1 sec and press the TRIGGER key to fix the setting.

**STEP 3--** The next parameter you will need to set is the total number of samples you will be collecting. By pressing the DATALOG key you will scroll through the

values, these vary from 10 to 200, set the parameter to 20 and press the TRIGGER key to fix the choice.

**STEP 4--**

The last parameter you will need to set is the time setting. This setting has three choices. The first choice is ZERO (0); this is used for real time data collecting and should only be used in conjunction with a program in the calculator. The second choice is ONE (1), this is the choice that you should use whenever you are collecting data and the CDA does not have to be collected to the calculator. This will give you the time readings in relative time. The third choice is two (2); this is the absolute time setting and is used in conjunction with a program from the calculator.

**STEP 5--**

At this point, you should have a temperature reading on your CDA. If you do not repeat steps 1-4. If you do have a reading and the word "READY" appears on the left side of the screen, grasp the temperature probe with the palm of your hand so that the tip of the probe is completely covered. Notice that the temperature on the CDA will begin to rise. Now press the trigger key. At this point, the word "sampling" will be flashing on the left side of the screen. Hold on to the probe until the word "DONE" appears on the screen. You have now collected one temperature reading every second for 20 seconds, and it is stored in the CDA. To repeat the experiment using the same parameters press the SHIFT RESTART key. (NOTE: This will delete the data from the previous sampling.)

**STEP 6--**

This section can be used with either the cfx-9850G or the fx-7400G by manually entering the data recorded in the EA-100 into the STAT MENU on the calculators.

To view the data that has been collected in the EA-100 press the DATALOG key on the EA-100. This will scroll you through the data samples. You will need to record these samples as the "Y" value and the TIME as the "X" values. Now you can have your students graph these data points on a piece of graph paper.

**A: This section is for use with the FX-7400 G.**

To use the calculator from the main menu screen press the number 2 to enter the STAT MENU. Enter the data with the time going into LIST 1 and the temperature going into LIST 2. Once the data is entered, press F1 [GRPH] and then press the green arrow key, then press F4 [SET]. Make sure that the G-TYPS is on SCAT and that your X-list and Y-list are set on the appropriate lists, LIST 1 & LIST 2.

**B: This section is for use with the cfx-9850G.**

WARNING: If the word MULTIMETER appears in the lower left hand corner of the CDA display screen, data transfer to the CFX-9850G will NOT BE POSSIBLE. To remove the word and enable data transfer, press the [MODE] key.

Connect the CDA to the CFX-9850G by using the DATA LINK CORD that came with your CDA. Be sure that the link cord is firmly attached to both units. You should hear a small click when the cord is inserted. You may first have to remove the little rubber stopper in the data port on both the CDA and the calculator. Turn on the calculator and go to the PROGRAM MENU and highlight the program RECEIVE. Now press the F1 key to execute the program.

You will get a DONE message in the upper right hand corner of your calculator screen if you were successful. If an error message appeared, make sure that all of the connections are complete and try again. You have just transferred all of the temperature readings from the CDA into LIST1 and LIST 2 of your calculator.

### **STEP—8**

In order to draw an appropriate regression model for the data you have, pick the choice from the bottom of your screen that you think most resembles what your graph looks like. For example, if you pick the linear regression model, F1, you will see the values for the slope and the Y-intercept of the equation along with the correlation coefficient (r). To draw the graph over the data points press the [DRAW] key, F4 on the fx-7400 or press F6 on the cfx-9850. Now if you tried to trace this function you will notice that you can only trace the points of the plot, and not the line of the graph. To do this press F1 again, [X], and press the [COPY] key, F3 on the 7400 and F5 on the cfx-9850. This command will copy the equation into the Graph Function Menu of the calculator. When the Graph Function screen appears, press the [EXE] key to store the equation. Your regression equation is now stored into the graph function menu of the calculator.

### **STEP—9**

Another feature that is nice to have is that you can go to the TABLE MENU and pull up a Table with the regression equation to do some predictions. From the MAIN MENU Screen, press the TABLE ICON. Check the table range, F3 on the fx-7400 and F5 on the cfx-9850, then press the [TABL] key to display the table. Remember you can change any X-value in the table by overwriting it with a new value, this will change the value in the Y column.

The above activity can be used to make the student feel more comfortable with the CDA and the calculator. You can also use variations on this activity by changing the time between sample readings and the amount of readings. By doing this you can discuss how this would affect the type of graph you would obtain and the type of regression model you might choose.

The next activity involves the same concepts as before, but takes it a step further. Now we are going to show how we can take full advantage of the capabilities of the CASIO CFX-9850G in conjunction with the CASIO Data Collector (CDA)

Dave Barron of Casio, Inc developed this activity.

#### Questions and Problems:

Level 1: Answer the following questions in complete, well-structured sentences.

1. Explain the term “metabolic rate.”
2. What factors can change your body temperature?
3. Give 3 examples of “cold blooded” organisms.
4. Give 3 examples of “warm blooded” animals, other than people.
5. Describe the shape of the curve the data makes?

Level 2:

1. What is the definition of a mammal?
2. What are the symptoms of a person nearing heat stroke? Explain the procedures to combat or give aid to a person suffering from heat stroke.
3. Discuss the reasons why some people have survived falling into icy rivers and lakes for extended periods of time.
4. Calculate the percent difference of your body temperature to that of the average of 37 degrees Celsius.

Extension: Have students research the duck-billed platypus. Is it a mammal or something else? They should support their position with research and facts.