CRICKET DATA COLLECTION –

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INVESTIGATING TEMPERATURE

I have taken and adapted this idea from:
http://www.shu.ac.uk/schools/sci/sol/invest/temperature/temper1.htm

I would like you to plan and carry out an investigation into the way in which the temperature varies over a period of time in a setting of your choice.

To do this you will learn to use CRICKET, which you will program to collect and store temperatures (data points) over a chosen period of time. CRICKET enables you to collect temperature readings throughout a 24 hour period (or throughout any time frame you choose). You can take up to 2500 reading during the time period you have chosen. Once CRICKET has gathered your data you will upload this set of data to your computer and then display the data set using the chart function of EXCEL.

What will I do? – These are rough guidelines, I am happy to discuss other ways of proceeding as you start to investigate.

Decide what may be interesting to find out that is temperature related.

Generate a testable question that requires you to collect several sets of data. e.g. *I'm always cold when I sit watching the television – where is the best place in the room to put my chair?* e.g. *Do those windshield screens that we use on a hot day really work?*

Program CRICKET to collect the data that you want to gather.

Display data set

Continue collecting as many data sets as you want in order to provide you with a means of answering the question you posed.

What will I submit to the instructor?

A PROJECT REPORT

➢ YOUR STARTING QUESTION

➢ PROCEDURE LOG OF WHAT YOU DID – this is not a formal methodology. I would like you to date the entries.

(i)   How you set about collecting data.

(ii)   Changes you made along the way and reasons for changes as you explored.
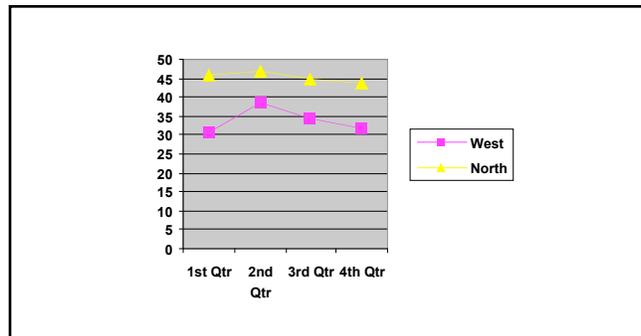
PROCEDURE LOG
June 9
Placed cricket in ... ...
..... collected temp data
every 30 minutes for 8
hours.
June 10
Placed cricket in ....
Collected data every 30
minutes for 8 hours
June 11
Looked at 2 data sets
and decided that I
needed to ..... because I
had not controlled .....

➢ EXCEL GRAPHS OF DATA

➢ DISCUSSION OF FINDINGS – what did you learn? what might explain the differences in the temperature data sets that you collected? what else do you need to test (what data do you need to collect) in order to have more confidence in your explanation?

➢ HYPOTHESIS FOR A FUTURE EXPLORATION - What hypothesis will guide future explorations that attempt to support the explanation you generated in the discussion.

You will also be required to give an ORAL REPORT in class.

HOW DO I USE THE CRICKET?

http://handyboard.com/cricket/

To use your Cricket, you will need to transfer computer instructions from a computer to the Cricket. Instructions are sent to the Cricket via infrared light, using a scheme similar to the one used in television remote controls.

➢ Professor Martin will give you a CD with the appropriate software to load on your home machine. You will also be given the INTERFACE CRICKET that plugs into the **SERIAL PORT*** of your computer and then your SENSOR CRICKET and 2 **temperature** sensors (you are not required to investigate using 2 sensors, but you might want to). ALL MATERIALS MUST BE RETURNED TO PROFESSOR MARTIN AT THE END OF THE SEMESTER AND BEFORE RECEIVING YOUR GRADE FOR THE COURSE.
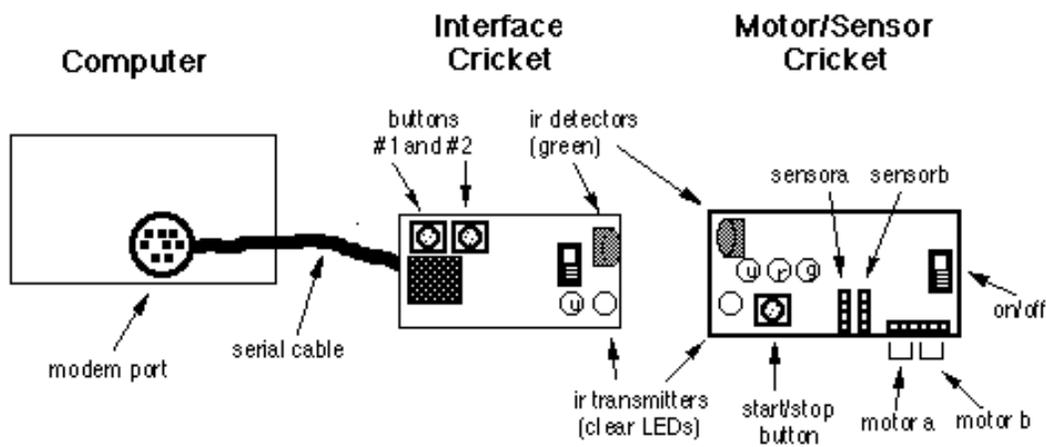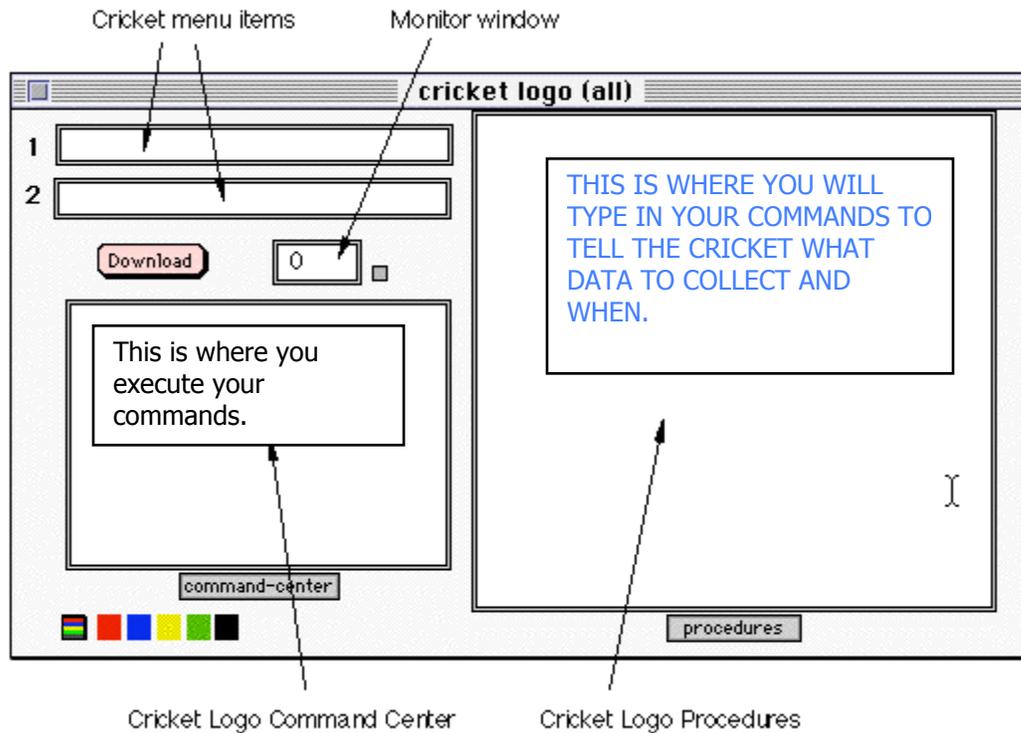
INTERFACE CRICKET can send information to and receive information from SENSOR CRICKET.

➢ Turn on your SENSOR CRICKET you will hear a BEEP and see a green light. If you don't the battery may be dead (replace it). Turn off until you want to use it.

The next step is to be able to program your cricket so it will collect your temperature data when you want it to. E.g. you might want to take 1 temp reading every minute for 1 hour; you might want to take 1000 temperature readings over 12 hours. You cannot set your cricket to take more than 2500 readings.

➢ You will be using CRICKET LOGO to send commands to your cricket. Once you have **loaded the software**, you will have a CRICKET LOGO folder under

programs in your START menu. Open CRICKET LOGO and you will see A SCREEN SOMETHING LIKE THIS

Cricket menu items   Monitor window

THIS IS WHERE YOU WILL TYPE IN YOUR COMMANDS TO TELL THE CRICKET WHAT DATA TO COLLECT AND WHEN.

This is where you execute your commands.

Cricket Logo Command Center   Cricket Logo Procedures

Here is a simple CRICKET LOGO PROGRAM to make your cricket beep twice. Let's call the program "to double beep" In the CRICKET LOGO PROGRAM box type the following:

    to double-beep

        beep

        wait 5

        beep

    end

Now press the DOWNLOAD icon and the program you wrote on your computer will be transmitted to your cricket.

The last step is to type the name of your program into the COMMAND CENTER box and press return. You should hear your double beep.

You will also want to start the program by pressing the RUN button on the sensor cricket. To do this you will type the program name into the RUN box & download.

COLLECTING TEMPERATURE USING YOUR CRICKET.

The first things to know is that we are using a CRICKET TEMPERATURE SENSOR and its unit are not degrees Celsius, you will be measuring temperature in CRICKET UNITS.

And here is another TWIST, if your cricket sensor gives you a reading of 120 cricket units, followed by another reading of 150 cricket units, then the temperature has DECREASED. In other words – the higher the cricket unit the lower the temperature.

Here are a few basic commands that you may use and modify in order to collect the data you need.

COMMAND 1 – TO ERASE-DATA

You may want to erase the data you have previously collected in another experiment so your don't get confused. In the CRICKET LOGO PROGRAMS box type the following:

to erase-data

    resetdp

    repeat 2500 [record 0]

end

DON'T FORGET TO DOWNLOAD YOUR PROGRAM TO YOUR CRICKET AND WRITE YOUR ERASE-DATA IN YOUR COMMAND CENTER

COMMAND 2 – TO TAKE DATA GO TO ALTERNATIVE FIRST

 You will want to take temperature readings over a period of time (using cricket units – see above). In order to do this you just takes readings with delays programmed in. Imagine that you want to take 1000 readings over an 8 hour period.

8 hours = 480 minutes = 28,880 seconds

If you want 1000 readings then you need a delay of about 29 seconds between each reading. For CRICKET 1 second = 10 cricket time units. Therefore you need a delay of 290 ------ so here is what you program

to take-data

       resetdp

       repeat 1000 [record sensora   (WILL TAKE 1000 READINGS from sensor a)

       beep   (WILL BEEP WHEN EACH READING IS MADE)

       wait 290]   (WILL WAIT 29 SECS BETWEEN READINGS)

end

DON'T FORGET TO DOWNLOAD YOUR PROGRAM TO YOUR CRICKET AND WRITE YOUR TAKE-DATA IN YOUR COMMAND CENTER

COLLECTING DATA WITH YOUR CRICKET

Imagine that you want to collect temperature data in a classroom throughout the day.

If you were using a thermometer you would decide when you would take these temperature readings i.e. every 15 minutes for 7 hours.

This would mean you would collect 28 readings with 15 minutes between each.

I HOPE YOU REMEMBER TO READ YOUR THERMOMETER

However, if you have a CRICKET you can program it simply to take your 28 readings. NO MORE LOOKING AT YOUR WATCH !

You will need to convert the minutes between readings [the WAIT TIME] to CRICKET TIME UNIT
1 minute = 60 seconds = 600 CRICKET TIME UNITS (CTUs)
15 minutes = 900 seconds = 9000 CTUs

SO YOU NEED……………
48 READINGS
WITH A WAIT OF 9000 CTUs between readings

And the simple CRICKET LOGO program is:
to take-data
    resetdp
    repeat 48 [record sensora
    wait 9000]
end

If you want to take a reading every 5 seconds in a 3 minute period, what would the CRICKET LOGO program be?
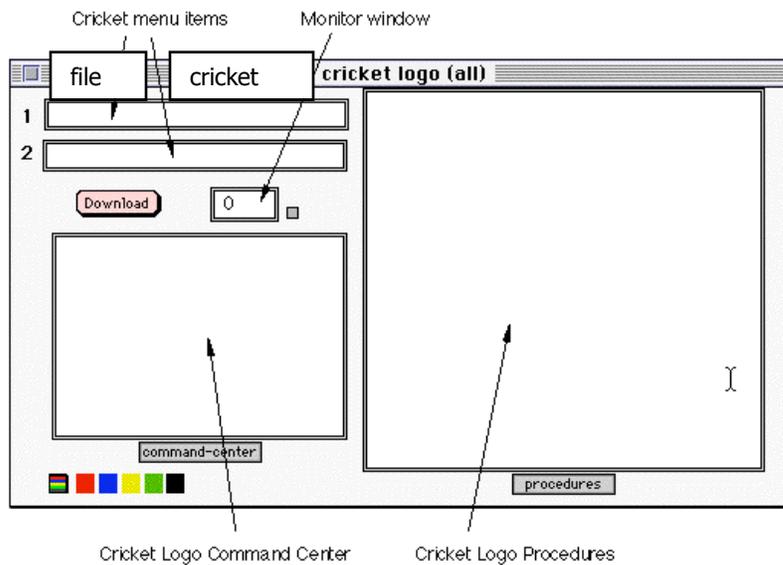
# of readings =

Wait time in secs =

Wait time in CTUs =

UPLOADING AND GRAPHING YOUR DATA

Your CRICKET has now stored the data you collected and you need to send it back to your computer.

On your CRICKET SCREEN choose **cricket** from the top bar.

Choose UPLOAD DATA from the menu

Type in the number of data points you programmed (in my example page 5 it would be 1000).

Choose number of sensors used – the default already there is 1.

Click "upload data" – this is very quick.

Click save file and choose where you want to put your data files on your computer.
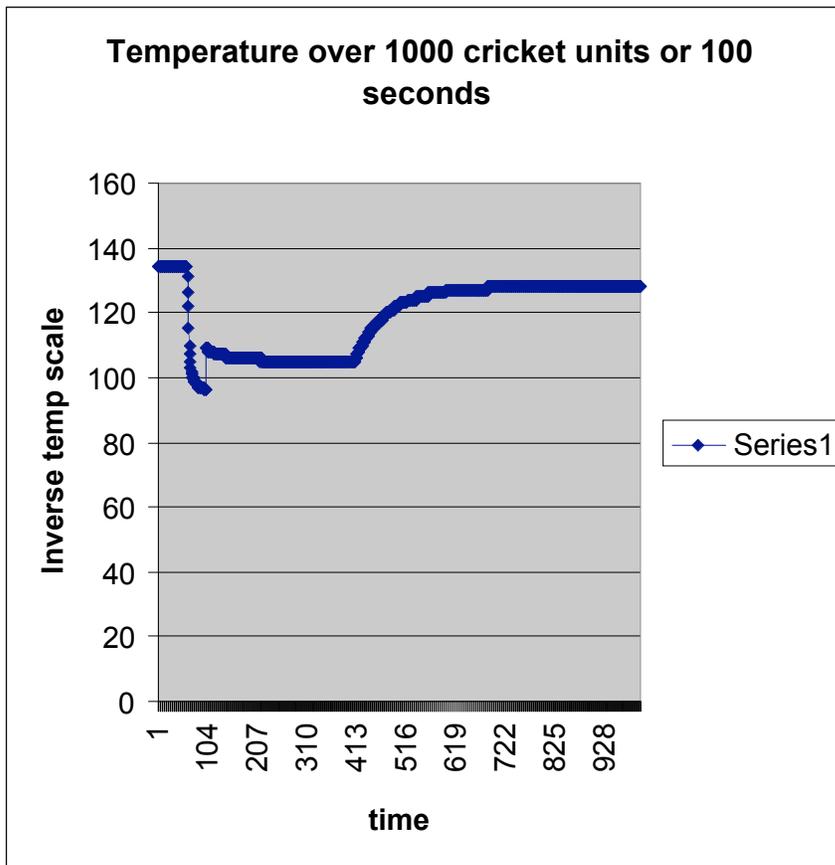

OPEN EXCEL

Choose DATA from the top bar

Choose GET EXTERNAL DATA

Choose IMPORT TEXT

Follow Excel instructions to get your data into column A

Click on the CHART feature to plot your data

Temperature over 1000 cricket units or 100 seconds

For those of you who want to use 2 sensors
You still can only take a maximum of 2500 – 1250/sensor

To make up an 8 hour experiment, you would need to delay twice as long, because you are looping 1250 times and not 2500 times.

```
To take-data2
  resetdp
  repeat 1250 [record sensora
            record sensor b
             beep
            wait 240]
end
```

When you upload the data, make sure you specify 2 points/line