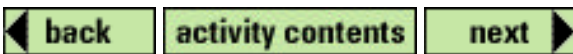


ACTIVITY CONTENTS:

Temperature Highs and Lows

- [Introduction](#)
- [Thinking About the Question](#)
- [Materials](#)
- [Safety](#)
- [Investigation I: Preparation of test site](#)
- [Investigation II: Logging temperatures Day one](#)
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- [Technical Hints](#)
- [Analysis](#)
- [Further Investigations](#)





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Temperature Highs and Lows Introduction

Discovery Question: How does the temperature in the outside air vary over a day?

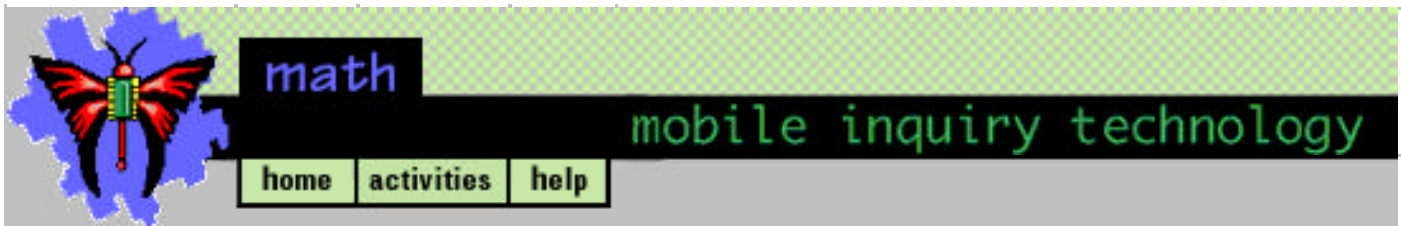


This activity will allow you to observe a pattern of temperatures in your area over a 24-hour period of time.

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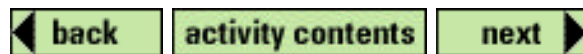


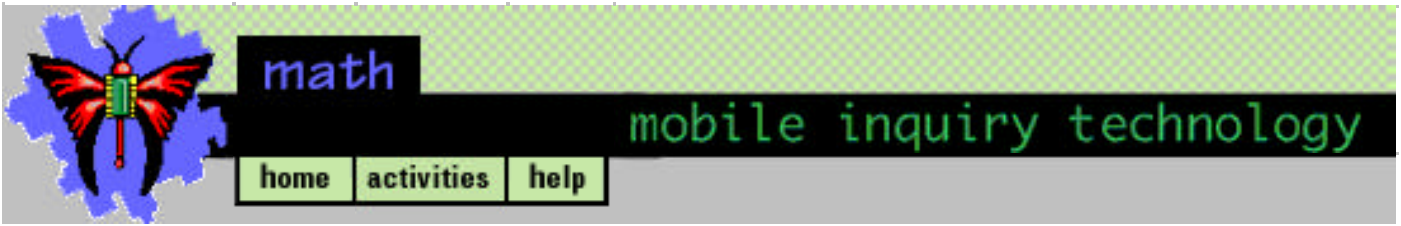
Thinking About the Question

How does the temperature in the outside air vary over a day?

You may have noticed that it is usually cooler when you leave for school in the morning than when you come home from school. Is this always true? When is the coldest and warmest time of the day? Is there a pattern? Your teacher will ask you to share your answers with the class.

You can use a temperature probe to find out the how temperatures vary throughout a day. You will monitor the outside temperature over two 24-hour periods.

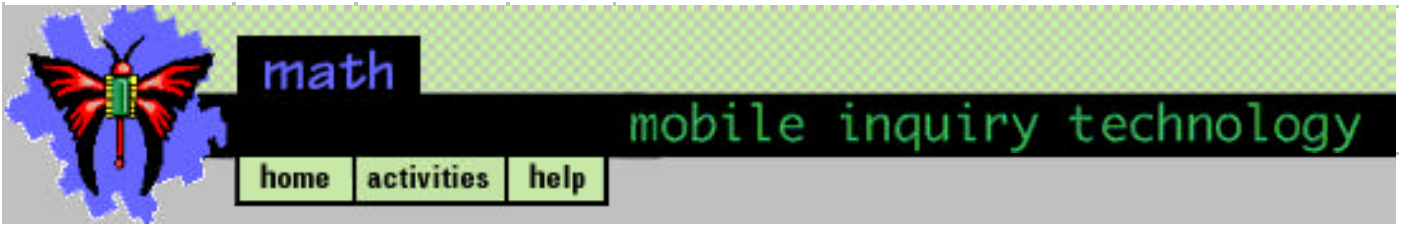




Temperature Highs and Lows Materials

- temperature probe
- meter stick

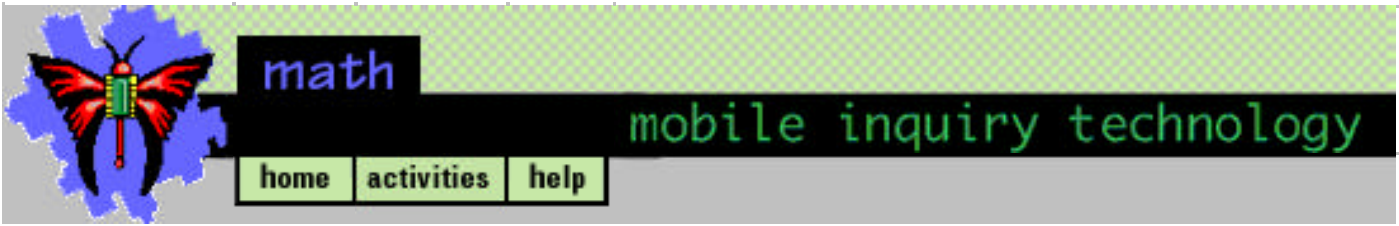




Temperature Highs and Lows Safety

Be careful that the placement of the computer is safe from weather and any outside forces.

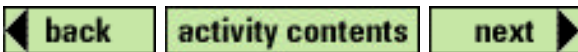


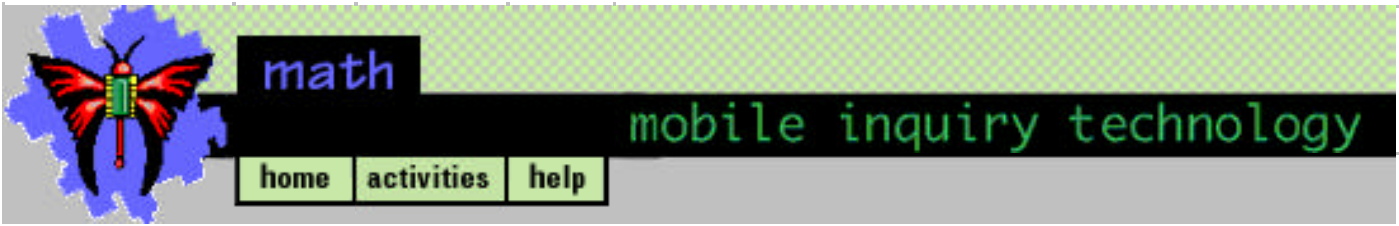


Temperature Highs and Lows Investigation I

Preparation of test site

1. Choose a location for your temperature observations. Discuss with your teacher appropriate locations that is secure to place the computer and probe for 24 hours.
2. Set-up your computer and temperature probe at your location.
3. Draw a diagram of your test location. Refer to [Technical Hints](#) to see how to use the draw program. Be sure to show the location of both the computer and the probe and nearby objects or obstacles that may affect the readings.
4. Refer to [Technical Hints](#) to see how to set the collection rate of the temperature probe. Set the collection rate for every hour. Set the time period for 24 hours.
5. Prepare a spreadsheet that will store temperature data for each day. Refer to [Technical Hints](#) to see how to make a spreadsheet.



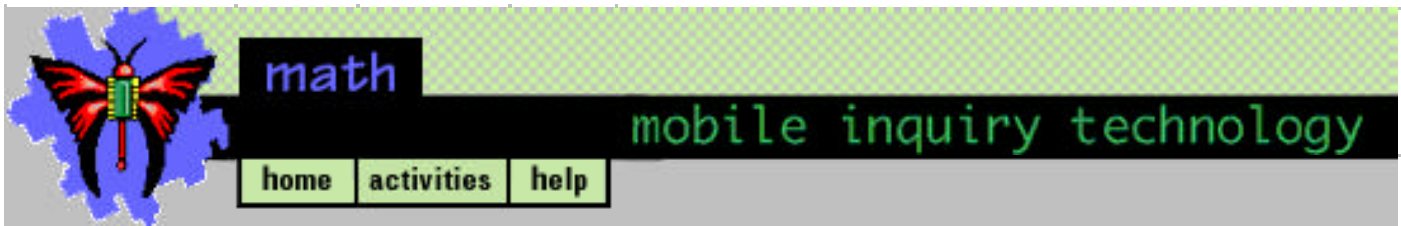


Temperature Highs and Lows Investigation II

Logging temperatures Day one

1. Record the time of day.
2. Start the collection of the temperature probe.
3. At the end of the 24-hour period, save the temperature data for day one. Refer to [Technical Hints](#) to see how to save temperature data.

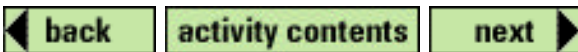


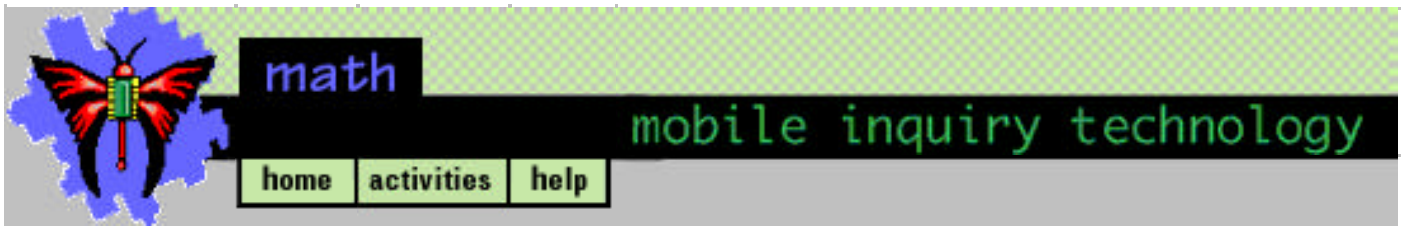


Temperature Highs and Lows Investigation III

Logging temperatures Day two

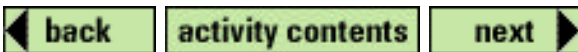
1. Record the time of day. The testing period should be close to the time from the previous day, so that comparisons can be made in the temperature data.
2. Start the collection of the temperature probe.
3. At the end of the 24-hour period, save the temperature data for day two. Refer to [Technical Hints](#) to see how to save temperature data.
4. Answer all questions in "Analysis".





Temperature Highs and Lows Technical Hints

- [Using the draw program](#)
- [Setting collection rate of the temperature probe](#)
- [Making a spreadsheet](#)
- [Saving temperature data](#)
- [Creating a x-y line graph](#)
- [Calculating mean temperature](#)

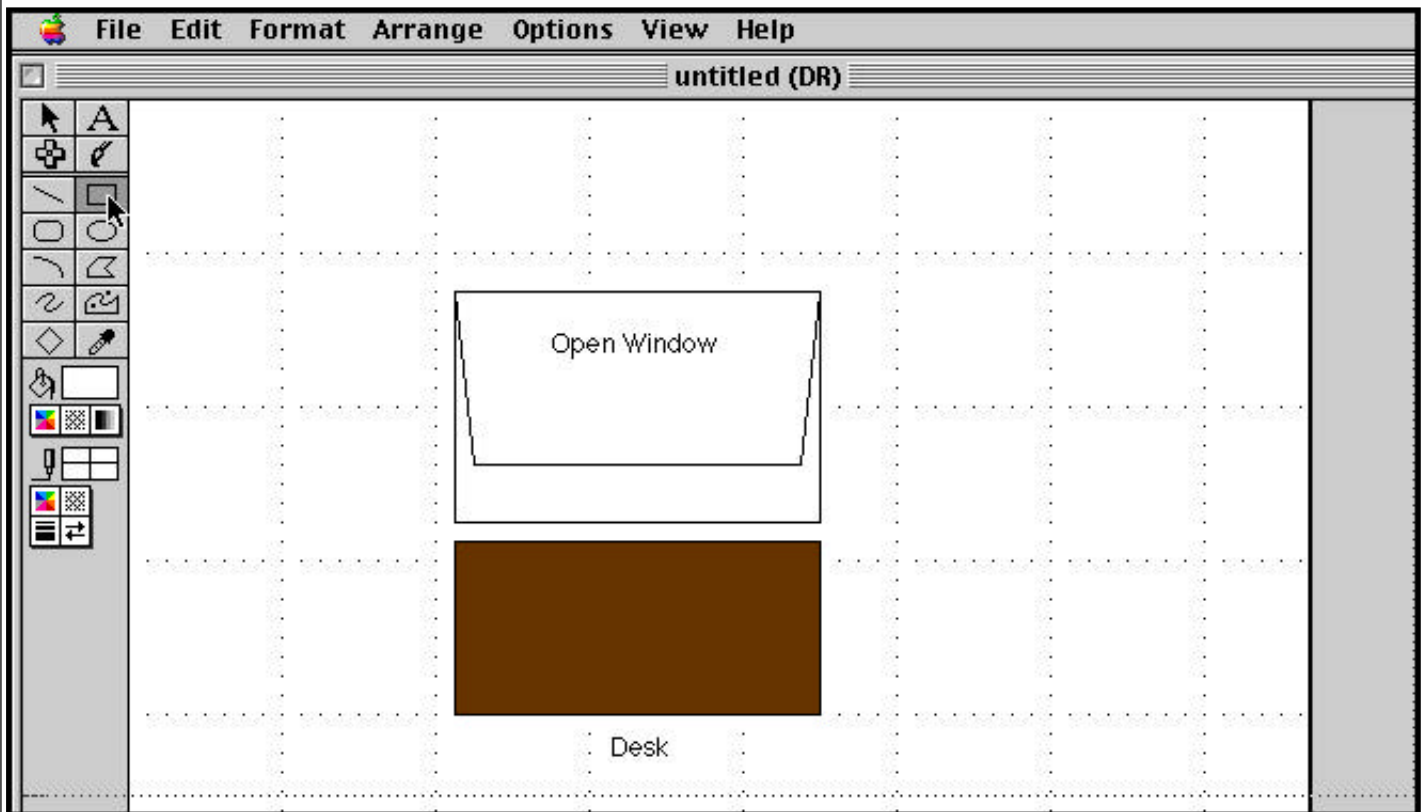




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Temperature Highs and Lows Technical Hints

To use the draw program:

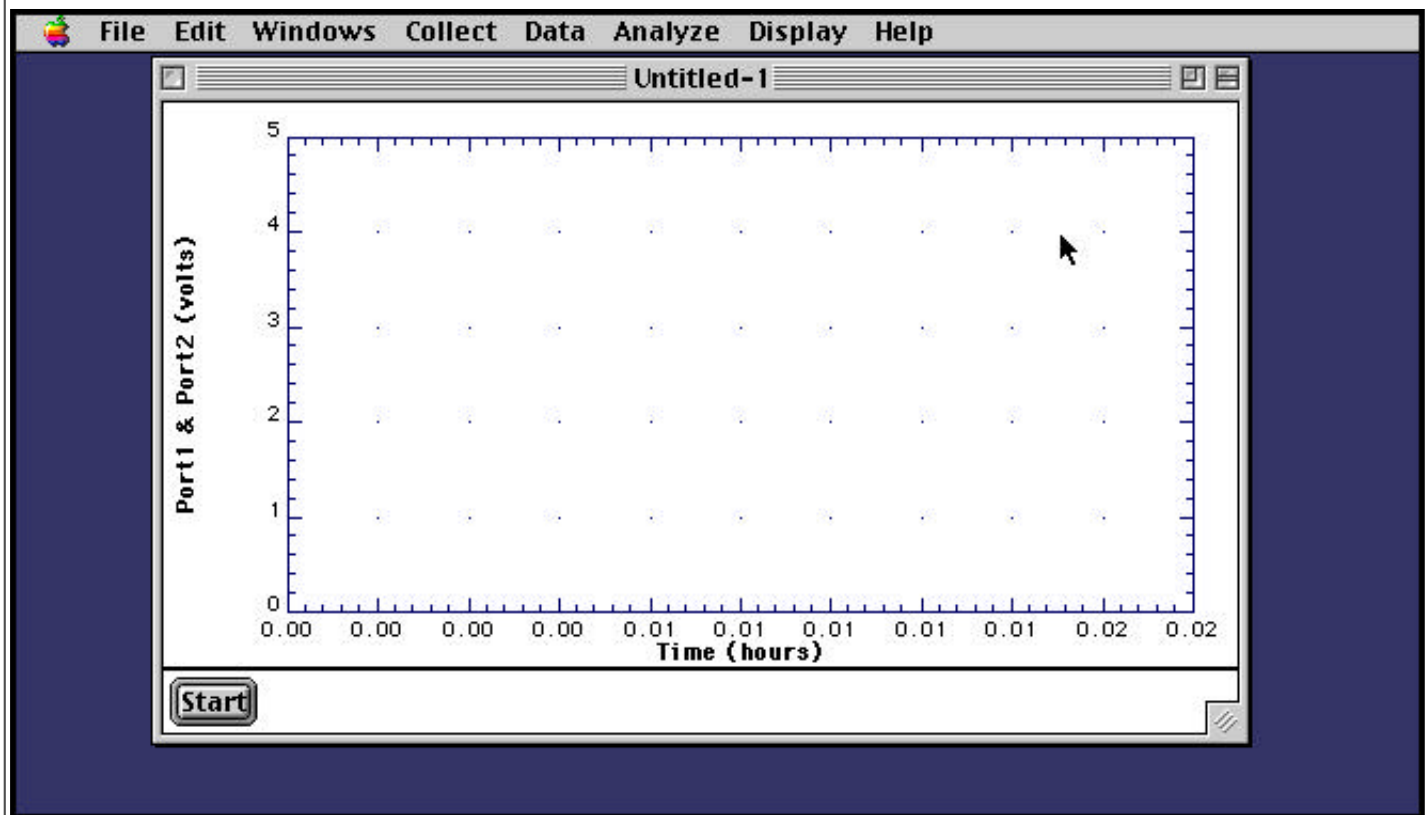
1. Open the ClarisWorks draw program by selecting it from the opening menu.
2. Select the type of tool that you want to use from the Tool bar. To change colors after you select your tool, click on the top color palette and select your color.
3. To write text, select the Text (A) tool and type in the location of your choice.
4. To move any object or text, click on the object with the Arrow tool and drag to the new location.





To set collection rate of the temperature probe:

1. Open the Chooser from under the Apple menu. Make sure AppleTalk is inactive.
2. Attach the temperature probe to the serial port at the back of the computer.
3. Double click on file named "cctemperature". It will automatically ask you if you want to load the "cctemperature.CLB" (calibration file for temperature probe). Click OK.
4. Select the Display menu and choose Timebase. Select hours. From the same menu select One Graph. Collect menu and choose Data Rate. Also from the Display menu choose Set All Min, Max. For this experiment, select 0-24 for hours. Click OK. Select 0-100 for degrees Celsius. Click OK.
5. From the Collect menu select Data Rate. Select 1 Point per Hour. Click OK.
6. Click Start to begin to collect data.



CLOSE



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Temperature Highs and Lows Technical Hints

To make a spreadsheet:

1. Open the ClarisWorks spreadsheet program by selecting it from the opening menu.
2. Title the first column as Hour in Cell A1. Title the second column for Temp Day One (C) in Cell B1. Title the third column as Hour in Cell C1. Title the fourth column for Temp Day One (C) in Cell D1. Title the fifth column for Start Time in Cell E1.

File Edit Format Calculate Options View Help										
TEMP 24 HOURS empty (SS)										
C2 x ✓										
	A	B	C	D	E	F	G	H	I	J
1	Hour	Temp Day One (C)	Hour	Temp Day Two (C)	Start Time					
2	1				10:40 PM					
3	2				11:40 PM					
4	3				12:40 AM					
5	4				1:40 AM					
6	5				2:40 AM					
7	6				3:40 AM					
8	7				4:40 AM					
9	8				5:40 AM					
10	9				6:40 AM					
11	10				7:40 AM					
12	11				8:40 AM					
13	12				9:40 AM					
14	13				10:40 AM					
15	14				11:40 AM					
16	15				12:40 PM					
17	16				1:40 PM					
18	17				2:40 PM					
19	18				3:40 PM					
20	19				4:40 PM					
21	20				5:40 PM					
22	21				6:40 PM					

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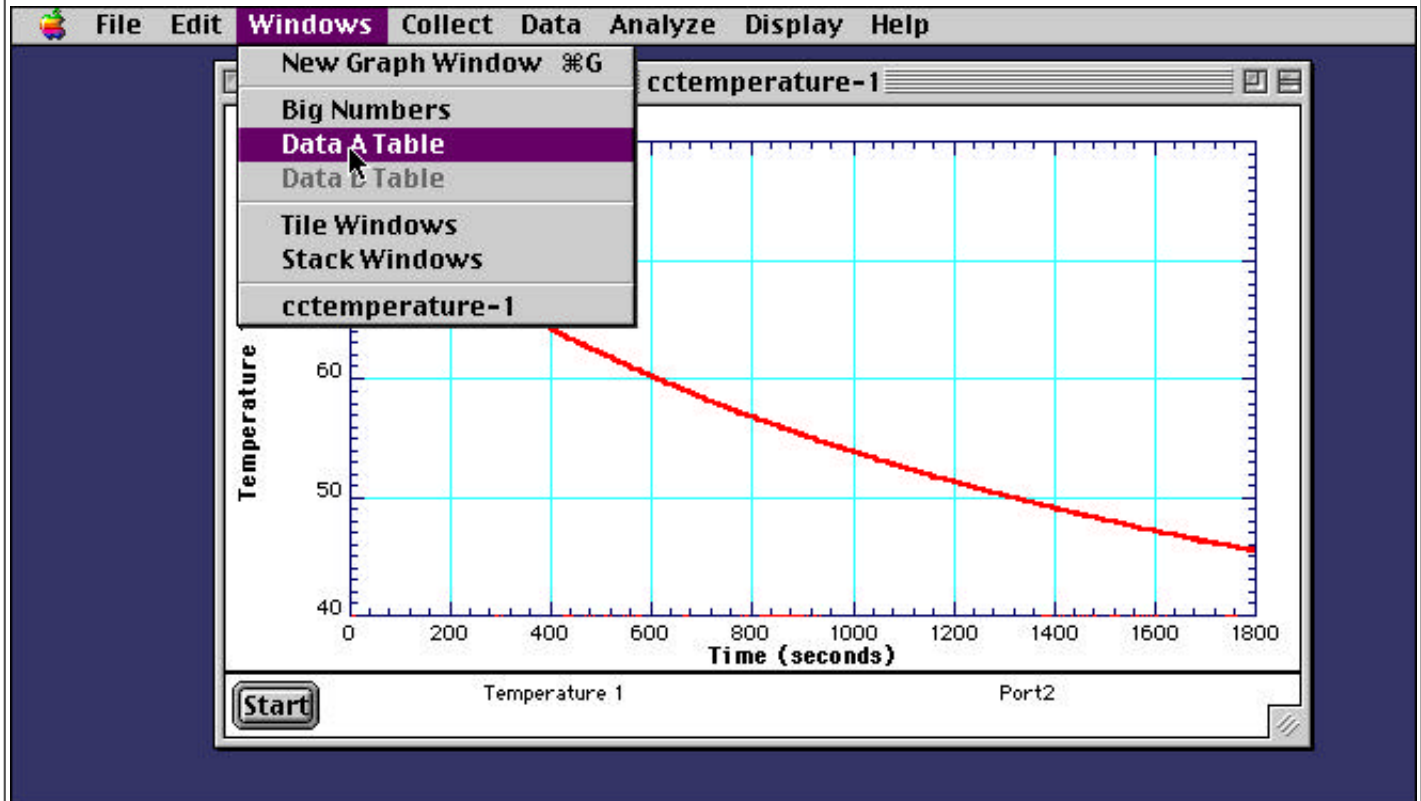


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Temperature Highs and Lows Technical Hints

To save temperature data:

1. To view data, select the Data A Table from the Windows menu. The data will be automatically highlighted. Select Copy Data from the Edit menu.
2. Select Save As from the File menu. Select the location that you want to save the data. Name the data. You will also be prompted save the calibration.



CLOSE



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Temperature Highs and Lows Technical Hints

To create a x-y line graph:

1. Transfer the data to the appropriate column by clicking in the top cell and selecting Paste from the Edit menu. If you need to recopy data, open your saved experiment and view Data Table A from the Windows menu and select Copy Table from the Edit menu.
2. Highlight the first four columns. Select Make Chart from the Options menu. Select the x-y Line graph.
3. To title the graph, double click on the graph. Select Labels and type High and Low Temperatures.
4. To change the markers to dots, select Series and click on the dots. The dots may provide a clearer picture of the data points.

The screenshot shows a software window titled "TEMP 24 HOURS FINAL (SS)". The window has a menu bar with "File", "Edit", "View", and "Help". Below the menu bar is a toolbar with a small icon and a dropdown menu showing "Hour Day One". The main area is a data table with columns A through H. The first four columns (A, B, C, D) are highlighted in yellow. The data in these columns is as follows:

	A	B	C	D
1	Hour Day One	Temp Day One (C)	Hour Day Two	Temp Day Two (C)
2	1	25	1	24.03
3	2	23.18	2	22.45
4	3	22.53	3	
5	4	21.75	4	
6	5	21.24	5	
7	6	21.24	6	
8	7	20.74	7	
9	8	20.2	8	
10	9	21.88	9	
11	10	24.48	10	
12	11	27.21	11	
13	12	28.25	12	
14	13	30.33	13	
15	14	32.14	14	
16	15	33.31	15	
17	16	35.26	16	
18	17	37.08	17	
19	18	37.6	18	
20	19	35.78	19	
21	20	34.22	20	
22	21	30.82	21	

Overlaid on the bottom right of the data table is a "Chart Options" dialog box. The dialog has a "Modify" section with buttons for "Gallery", "Axes", "Series", "Labels", and "General". The "Gallery" button is selected. The "Gallery" section shows various chart types: Bar, Area, Line, Scatter, Stacked Bar, Stacked Area, X-Y Line, and X-Y Scatter. The "X-Y Line" option is selected. Below the gallery, there are checkboxes for "Color" (checked), "Horizontal", "Shadow", and "3-dimensional". A "Cancel" button is at the bottom right of the dialog box.

Below the data table, there is a blue button labeled "CLOSE".



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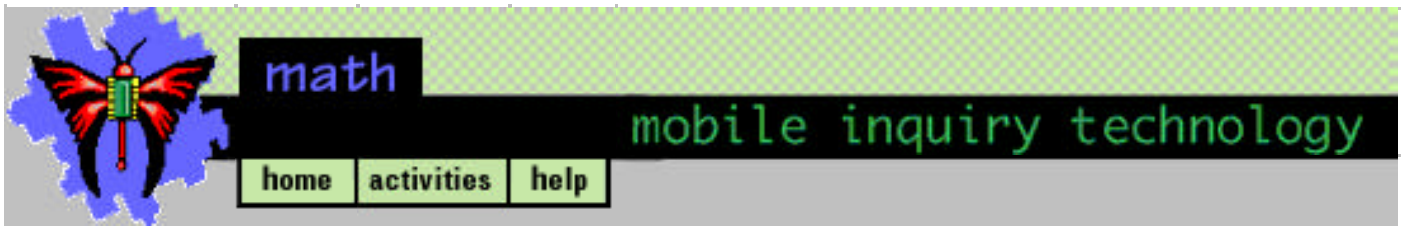
Temperature Highs and Lows Technical Hints

To calculate mean temperature:

1. Locate the cell for the mean value. Select Paste Function from the Edit menu.
2. From the dialog box, select average. In the title bar, highlight within the parentheses. Type in the start cell and end cell separated by a comma. Click on the check mark.

File Edit Format Calculate Options View Help						
TEMP 24 HOURS FINAL (SS						
D27 x ✓						
	A	B	C	D	E	
1	Hour Day One	Temp Day One (C)	Hour Day Two	Temp Day Two (C)	Start Time	
2	1	25	1	21.03	10:40 PM	
3	2	23.18	2	22.45	11:40 PM	
4	3	22.53	3	22.38	12:40 AM	
5	4	21.75	4	21.53	1:40 AM	
6	5	21.24	5	21.08	2:40 AM	
7	6	21.24	6	20.64	3:40 AM	
8	7	20.74	7	20.31	4:40 AM	
9	8	20.2	8	20.11	5:40 AM	
10	9	21.88	9	21.66	6:40 AM	
11	10	24.48	10	24.17	7:40 AM	
12	11	27.21	11	27.13	8:40 AM	
13	12	28.25	12	28	9:40 AM	
14	13	30.33	13	29.17	10:40 AM	
15	14	32.14	14	30.78	11:40 AM	
16	15	33.31	15	32.18	12:40 PM	
17	16	35.26	16	33.87	1:40 PM	
18	17	37.08	17	35.65	2:40 PM	
19	18	37.6	18	35.74	3:40 PM	
20	19	35.78	19	33.89	4:40 PM	
21	20	34.22	20	33.23	5:40 PM	
22	21	30.82	21	30.19	6:40 PM	
23	22	27.6	22	26.45	7:40 PM	
24	23	25.65	23	23.38	8:40 PM	
25	24	24.74	24	23.24	9:40 PM	
26						
27	Mean Temp	24.87				
28						

CLOSE

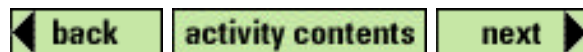


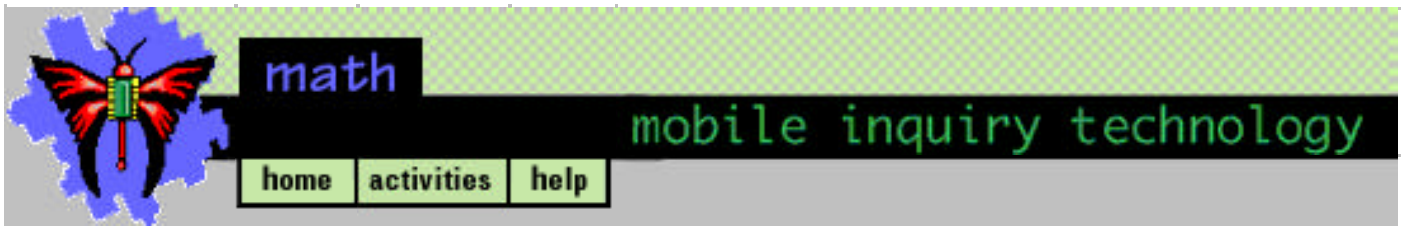
Temperature Highs and Lows Analysis

1. Create a x-y line graph of the temperature values for each day on the same graph. Refer to [Technical Hints](#) to see how to create a x-y line graph.

Use your graph to complete the following on paper:

2. Review your predictions about the warmest and coldest time of the day. How did the data compare to the predictions? What is the general pattern in temperature changes each day?
3. How much does the temperature vary each day? How does the high or low vary each day? What is the high and low temperature of both days? How did weather conditions affect the highs and lows?
4. The mean (or average) daily temperature is the sum of all of the temperatures taken during one day divided by 24 (the number of temperature readings taken over the day). How did the observable weather conditions relate to the mean temperature values? Refer to [Technical Hints](#) to see how to calculate the mean temperature. What is the mean temperature each day? How much does the mean vary each day? Suggest a method to calculate the mean temperature over both days. What is that temperature?
5. Compare your line graph to other groups that placed their temperature probe at different locations. Explain any difference in the data.





Temperature Highs and Lows Further Investigation

- Log high and low temperatures for a month. Calculate, graph, and relate the mean temperature patterns to the season using the computer.
- Communicate with other classes or schools that have collected high and low data. How do their mean temperature values compare for the same days?

