Appendix B—Lesson 1: What Is Weather Exit Ticket

Name _____ Date _____
Period _____

What is Weather?

Exit Ticket

List 3 things that you learned during the demonstrations today.

What are two questions that you still have?

Give one answer to the question, “What causes weather?”

Name _____ Date _____
Period _____

What is Weather?

Exit Ticket

List 3 things that you learned during the demonstrations today.

What are two questions that you still have?

Give one answer to the question, “What causes weather?”

Appendix B—Lesson 2: Air Pressure Investigation Recording Sheet

Name _____ Date _____ Period _____

Test #1 Prediction

Test #1 Observation

Test #2 Observation

Test #3 Observation

Test #4 Observation

Questions and Conclusions

1. What type of data did you collect during your investigation? How do you know what type of data it is?

2. Why does the water stay in the cup for Tests #1, #2, and #4, but not for Test #3?

3. In which direction is air pressure being exerted on the water and index card? Another way to think about this is: In which trial(s) was air pressure pressing upward on the water/card? In which trial(s) was air pressure pressing sideway on the water/card? In which trial(s) was air pressure pressing down on the water/card?

4. Why do you think we do not usually feel the pressure of the atmosphere around us? When *do* we feel air pressure?

Write a brief paragraph summarizing what you learned about air pressure from this investigation.

_____

_____

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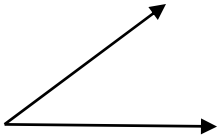
Appendix B—Lesson 3: Warm-up Sheet

Name_____ Date _____ Period _____

Angles of Light and Surface Temperature

Warm-up, Day 1

Identify each type of angle.

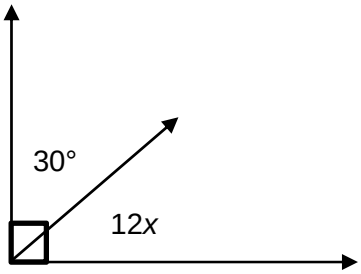
1. 

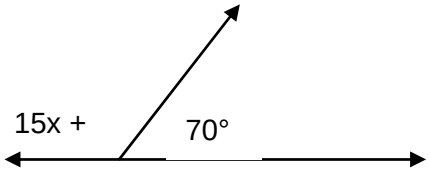
2. 

3.

4. 

Find the value of *x* in each unknown angle.

5. 

6. 

Warm-up, Day 2

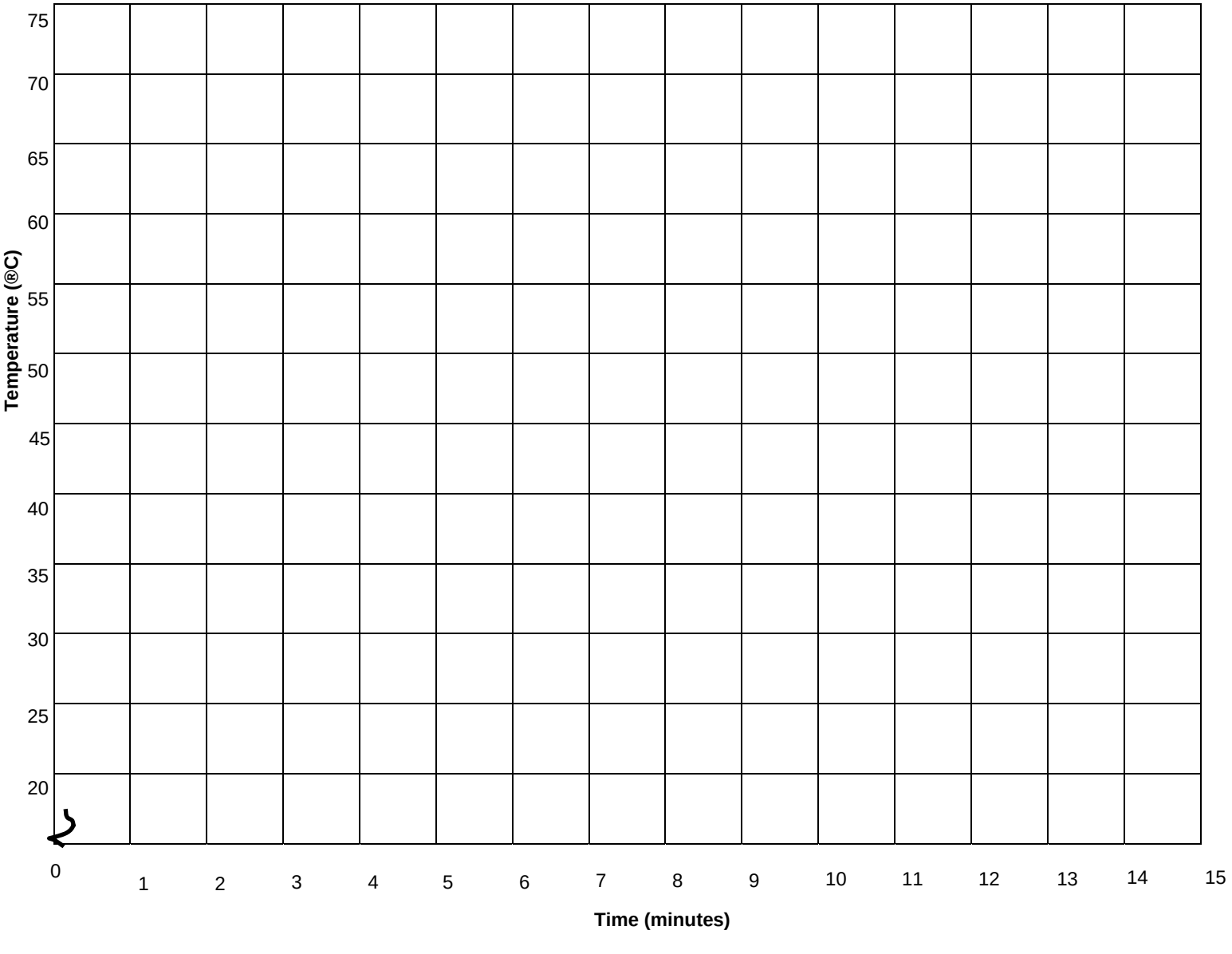
Read your predictions from yesterday's investigation.

1. If you were going to do the investigation over again today, would you predict the same outcomes for each thermometer? Why or why not?

2. Explain why the thermometers did not heat up to the same temperature.

Appendix B—Lesson 3: Angle of Sunlight vs. Surface Temperature Prediction and Recording Sheet

Prediction: What will happen to each thermometer over time?																
Thermometer A:																
Thermometer B:																
Thermometer C:																
Time (min.)	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total Change in Temp.**
Thermometer A:																	
Thermometer B:																	
Thermometer C:																	



1. Which thermometer showed the greatest temperature increase? Why?

2. What parts of the globe would your thermometers best represent?

3. Using what you observed and learned in this activity, how can you explain the fact that the equator is hotter than the poles?

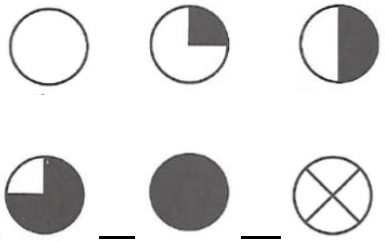
4. If you were given a data table that listed the average yearly temperatures as you go away from the equator, do you think you would see a trend in the temperature? Why or why not?

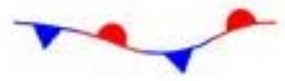
5. What kind of relationship(s) is shown in the graph you made on the front of this page?

6. What equations can you write to approximate the relationship between time and temperature for each thermometer?

7. What limits are there for the x values for time that could be plugged into the equations in order to approximate temperature at that time?

Appendix B—Lesson 4: Weather Map Foldable

Cold Front			**Cloud Cover**
Warm Front			
Stationary Front			**Present Weather Conditions**
Wind Speed			



Appendix B—Lesson 4: Questions and Conclusions

Name_____ Date _____ Period _____

Answer the following questions referring to the weather map:

1. What is the “present” weather in Dallas, Texas?

2. What is the atmospheric pressure in Kansas City?

3. From which direction is the wind blowing at Hatteras, North Carolina, and what is its speed?

4. What is the temperature in Pueblo, Colorado?

5. What is the cloud cover in Miami, Florida?

6. What is the atmospheric pressure in Roswell, New Mexico?

7. What is the “present” weather in Chicago, Illinois?

8. What is the cloud cover in New York City?

9. What region of the nation appears to be generally cloudy? What region appears to be generally clear?

10. In Weather City, the atmospheric pressure is 1010 mb. The temperature is 54° F, and the dew point is 40° F. The wind speed is 15 kt from the southeast. The cloud cover is 50%. Draw the weather symbols that represent the data recorded at Weather City.

11. Use a colored pencil to lightly shade all areas on the weather map that are experiencing 100% cloudiness or precipitation.

12. Can you make an inference about the season (time of year) that this weather map was recorded? Why or why not?

13. Based on the weather map, do you see any severe weather conditions that might lead to a weather warning? Explain your reasoning.

14. Why is it important to be informed about weather conditions?

15. Of all the weather conditions that occur in your area, which pose threats to life and property?

Appendix B—Lesson 5: Severe Weather Reading Handout
Questions and Conclusions Page

Name_____ Date _____ Period _____

Answer the following questions, referring to the reading *The Inner Workings of Severe Weather* from *Project Earth Science: Meteorology*.

1. Write 1 to 2 paragraphs summarizing the article.

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_____

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2. Draw a picture of what causes lightning in storm clouds. Use plus signs to represent the positive charges and negative signs to represent the negative charges.

3. What percent of arcs reach the ground?

4. Describe at least three identifying characteristics of tornadoes.

5. Why are rivers, ponds, and lakes sometimes left dry after a tornado?

6. Describe the progression of a low pressure area turning into a hurricane. What conditions must occur before each step of the progression is met?

7. What causes hurricanes to lose their source of energy? Why does this cause the loss of energy?

8. What has been the most dangerous severe weather event over the past 20 years? Why do you think that hurricanes are not as deadly as this weather event?

Appendix B—Lesson 5: Hurricane Ike Data Tables Table 1

Name_____ Date_____ Period_____

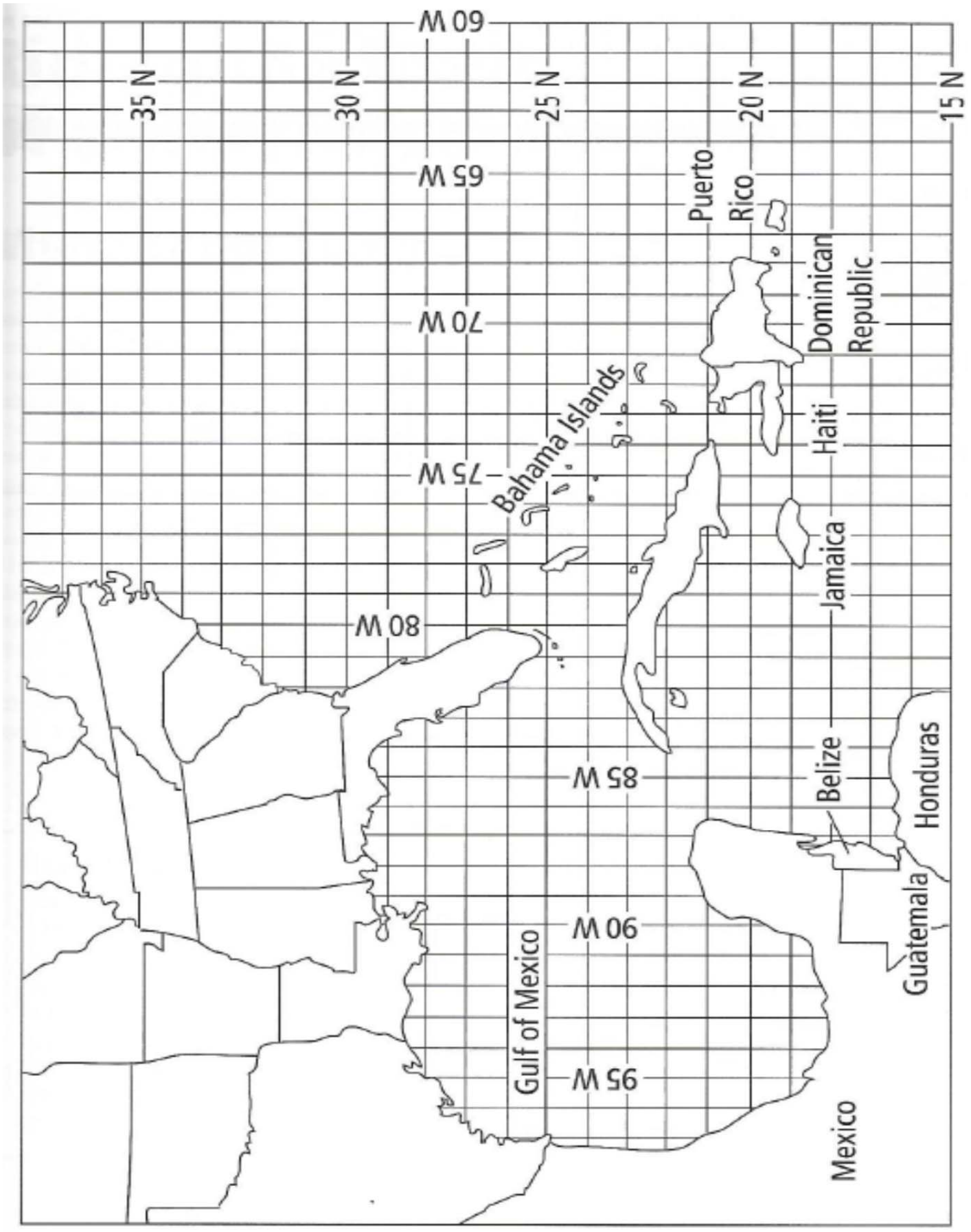
Date	Time	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)
9/5	0600	23.6	60.4	949	115
9/5	1200	23.5	61.9	954	105
9/5	1800	23.2	63.4	959	100
9/6	0000	22.8	64.9	962	100
9/6	0600	22.4	66.3	964	100
9/6	1200	21.9	67.7	965	95
9/6	1800	21.5	69.0	950	115
9/7	0000	21.2	70.3	947	115
9/7	0600	21.1	71.6	947	115
9/7	1200	21.0	72.8	947	110
9/7	1800	21.0	74.0	946	105
9/8	0000	21.1	75.2	945	115
9/8	0600	21.1	76.5	950	100
9/8	1200	21.1	77.8	960	85
9/8	1800	21.2	79.1	964	75
9/9	0000	21.5	80.3	965	70
9/9	0600	22.0	81.4	965	70
9/9	1200	22.4	82.4	965	70
9/9	1800	22.7	83.3	966	65
9/10	0000	23.1	84.0	968	65
9/10	0600	23.4	84.6	964	70
9/10	1200	23.8	85.2	959	80
9/10	1800	24.2	85.8	958	85
9/11	0000	24.7	86.4	944	85
9/11	0600	25.1	87.1	945	85
9/11	1200	25.5	88.0	946	85
9/11	1800	25.8	88.9	952	85
9/12	0000	26.1	90.0	954	85
9/12	0600	26.4	91.1	954	90
9/12	1200	26.9	92.2	954	90
9/12	1800	27.5	93.2	954	90
9/13	0000	28.3	94.0	952	95
9/13	0600	29.1	94.6	951	95
9/13	1200	30.3	95.2	959	85
9/13	1800	31.7	95.3	974	50
9/14	0000	33.5	94.9	980	35
9/14	0600	35.5	93.7	985	35
9/14	1200	37.6	91.0	987	40
9/14	1800	40.3	87.2	988	50
9/15	0000	43.3	81.5	988	50
9/15	0600	45.8	75.3	986	40
9/15	1200	47.2	71.1	986	35
9/15	1800	Incorporated into another low pressure weather system			

Table 2

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm Surge (ft)	Storm Tide (ft)
	Date/Time (UTC)	Pressure (mb)	Date/Time (UTC)	Sustained (kt)	Gust (kt)		
Port Arthur, Texas	13/0856	962.8	13/0654	47	73	11.25	11.93
Texas Point, Texas	13/0609	972.2	13/0406	57	80	11.79	13.37
Shell Beach, Louisiana	12/0948	1005.5	12/1012	23	30	7.51	7.81
Grand Isle, Louisiana	12/2030	1006.4	12/1730	29	45	3.84	5.22
Calcasieu Pass, Louisiana	13/0936	989.5	13/0818	61	75	10.40	11.94

Notes

Appendix B—Lesson 5: Hurricane Ike Tracking Map



Appendix B—Lesson 5: Hurricane Ike Tracking Handout

Name_____ Date _____ Period _____

Hurricane Watches and Warnings

For each asterisk/star on your tracking map, issue a hurricane watch and/or hurricane warning for a specific area. Base your decisions on how far, and in which direction, the hurricane has traveled in the past 24 hours.

Storm Surge Data

Look at the storm surge data in Table 2. What does this data tell you about the landfall of Hurricane Ike in that area? Explain your reasoning and analysis of the data.

Questions and Conclusions:

1. Where did Hurricane Ike do the most damage before striking the United States? Why do you think this?

2. Refer to Table 1. Based on the latitude and longitude data, describe how the storm moved from the first point to the last. Explain your reasoning.

3. Where did Hurricane Ike go after making landfall on the coast of Texas?

4. What type of severe weather might have occurred in other areas that were in the path of the storm?

5. Judging from wind speed, when did Ike downgrade to a tropical storm?

Based on the data on storm surge in Table 2, what can you conclude about the relationship between wind speed and surge, and why some areas received different storm surges

Appendix B—Lesson 5: Air Pressure and Wind Speed Handout

Name_____ Date _____ Period _____

1. For each graph you created, describe the general relationship of the data. Explain your reasoning.

Air Pressure vs. Time

Wind Speed vs. Time

2. On each graph draw a line of best fit and then record the equation, in slope-intercept form, of the line of best fit below. Show your work in the space provided.

Air Pressure vs. Time

Wind Speed vs. Time

3. For each of your equations from question 2, interpret the slope and y-intercept. What does each mean in the context of the graph?

Air Pressure vs. Time

Wind Speed vs. Time

The equations you wrote for the lines of best fit can be used to predict Air Pressure and Wind Speed at specific times. What are the limitations of those predictions? Are there times for which the predictions would not be accurate/appropriate

Appendix A—Lesson 6: Flash! Bang! Handout A

Name_____ Date _____ Period _____

1. Based on Figure R10.1, approximately how many people died as a result of floods between 2000 and 2009? From tornadoes?

2. What percent of the average yearly deaths between 2000 and 2009 were caused by lightning?

3. Make a statement that compares the number of deaths from floods and the number of deaths from tornadoes between 1966 and 1995. Explain your reasoning.

4. Figure R10.3 charts the more than 15,000 lightning strikes that went to ground during a six-hour period during a storm in the Midwest. The reading also states that only 10% of lightning strikes are cloud-to-ground. With that information, make an approximation of the total number of lightning strikes during that six-hour period.

5. The reading stated, “Global patterns are probably not influenced by human activity. This means that buildings and metal communications towers do not increase the overall frequency of lightning.” Does this statement surprise you? Why or why not?

6. The reading described the flash-to-bang method of determining the distance of lightning from your location. If you counted 12 seconds between a flash of lightning and its thunder clap, approximately how far away did the lightning strike? Show all of your thinking/calculations.

Appendix B—Lesson 6: Flash! Bang! Handout B

Name_____ Date _____ Period _____

Summarize the sections you read in one or two paragraphs:

1. The reading states that Florida has an extremely high number of lightning deaths and injuries. Consider what you know and have heard about Florida and its climate. What inferences can you make about the reason for the high number of deaths and injuries? Support your conclusions with reasoning.

2. What percent of the average yearly deaths between 1959 and 1994 were caused by lightning that occurred in February through May?

3. Underreporting of lightning-caused deaths was discussed in the reading. If the underreporting is 30%, approximately how many deaths were caused by lightning in August between 1959 and 1994? Injuries in March? Show all of your calculations.

4. Why do you think so much data is gathered on lightning? Is it an important topic for scientists to study? Defend your answers.

Appendix B—Lesson 6: Flash! Bang! Handout C

Name_____ Date _____ Period _____

1. How would you describe the formation of lightning to a sixth grader? Consider their vocabulary and science knowledge to make your description appropriate, but still very clear. Write your explanation below.

_____
_____
_____
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2. The reading states that the United States has at least 100 million lightning flashes every year. Approximately how many lightning flashes is that per week? Per hour? Per second? Show all of your calculations and explain your thinking.

3. According to the reading, “the brightness of a single flash [of lightning] is more than 10,000,000 times light bulbs of 100 watts.”

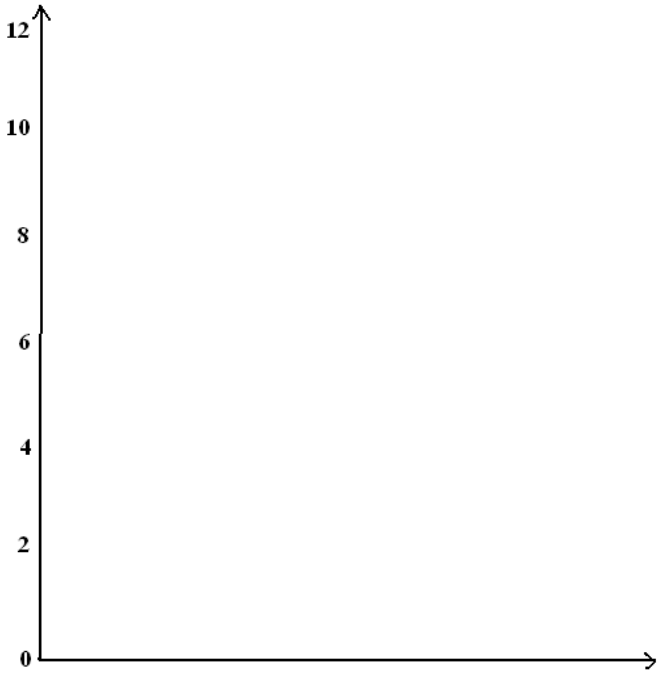
a. Express the total number of watts as a power.

b. How many light bulbs would each resident of Ontario need to use in order to use 10,000,000 light bulbs in a year? Round the population of Ontario to 11,000. Show all of our calculations.

4. In math, the phrase “Please Excuse My Dear Aunt Sally” is used to remember PEMDAS, the order of operations. Create a phrase that you and the rest of the class can use to remember the steps of avoiding dangerous lightning situations. Explain your phrase and the steps below.

Appendix B—Lesson 7: Graphing Stories Handout

Name_____ Date _____ Period _____



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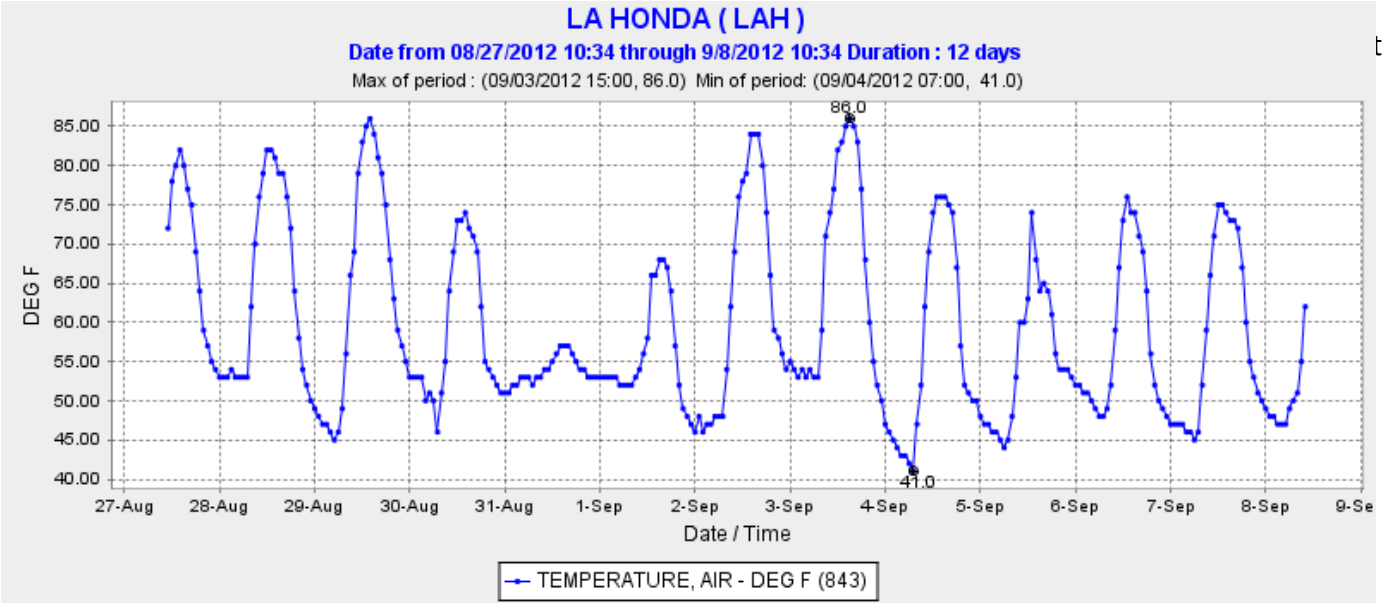


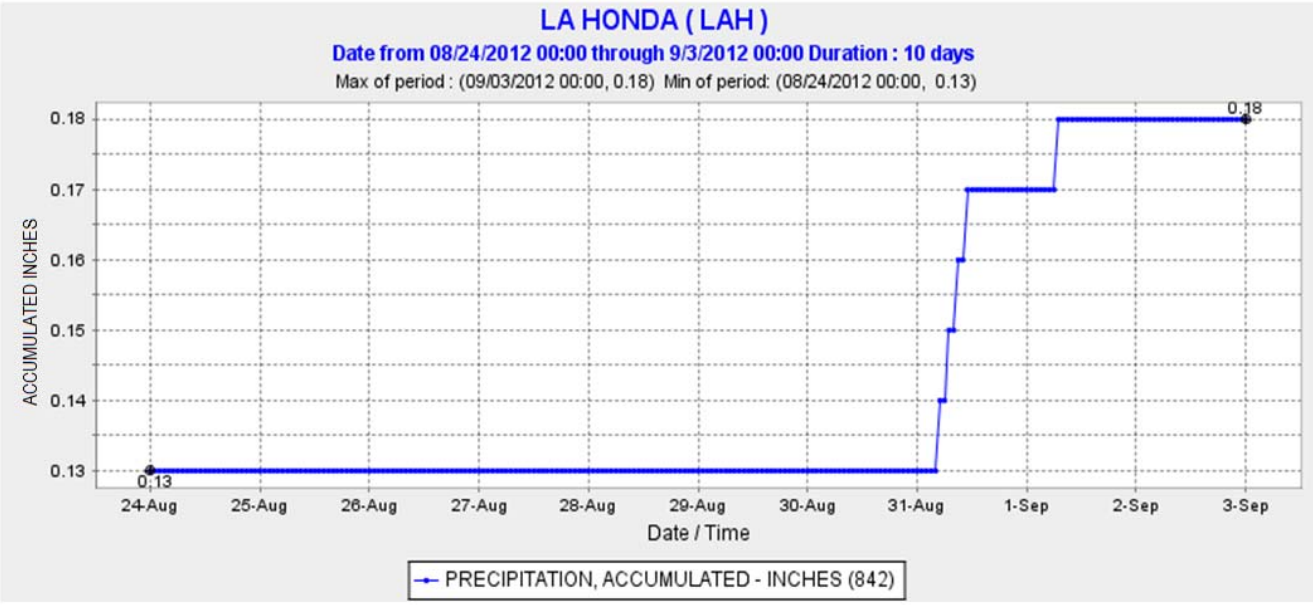
1. The graph seems to alternate between peak, valley, peak. Explain why.

2. When do you think it should be the warmest during each day? Circle the peak of each day to determine if the graph matches your guess.

3. When do you think it should be the coldest during each day? Draw a dot at the lowest point of each day to determine if the graph matches your guess.

4. Does the graph do anything unexpected, such as not following a pattern? What do you notice? Can you explain why it's happening?

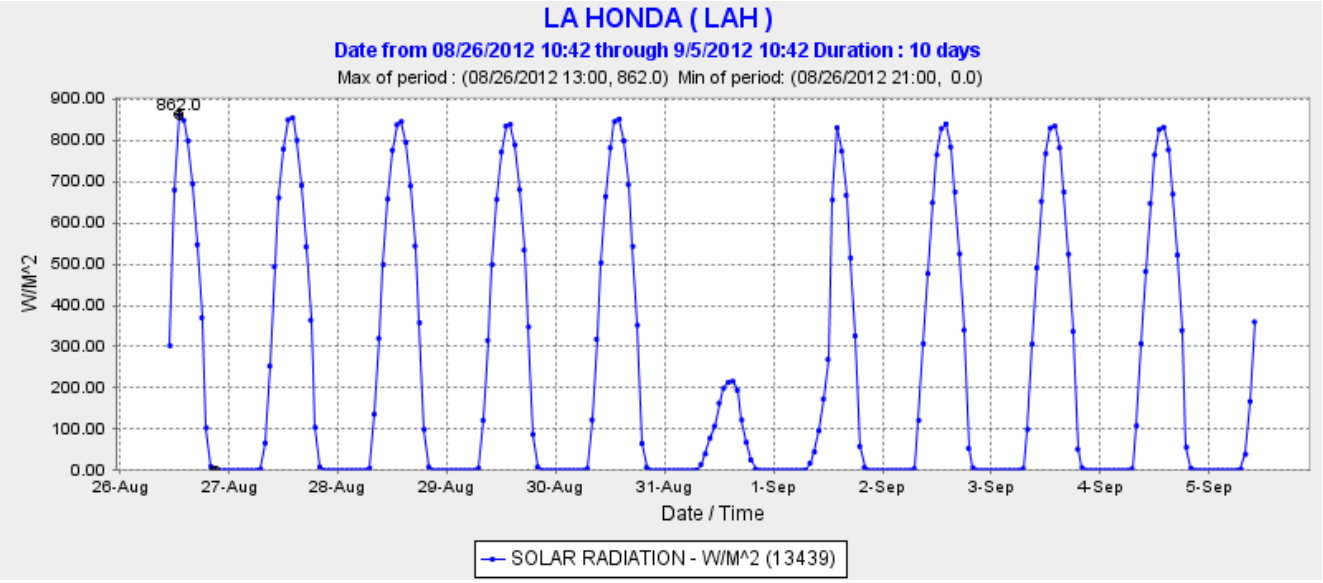
The following graph shows the amount of precipitation (rain, snow, or hail) that accumulated over a period of time in La Honda, CA.



5. Tell the complete story of this graph.

6. The term “accumulate” in context of the graph means to add up the amounts of precipitation over time. The graph starts on August 24^{th}. Why did the graph start at 0.13 inches instead of starting at 0 inches?

The following graph shows the solar radiation over a period of time in La Honda, CA. Solar radiation is the amount of the sun's rays that reach the Earth's surface.



7. What happens in La Honda when the graph is flat?

8. What do you think is happening when the peaks are very low?

9. Looking at all three graphs above, what do you conclude happened on August 31st, 2012 in La Honda, CA?