

MAST ACADEMY OUTREACH

MIDDLE SCHOOL PROGRAM

Adventures Aboard

WOW

(Weather on Wheels)

On-Site Packet



MAST Academy

Maritime and Science Technology High School

Miami-Dade County Public Schools

Miami, Florida

**MAST ACADEMY OUTREACH
WEATHER ON WHEELS
MIDDLE SCHOOL ON-SITE PACKET**

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The “thinking” symbol appears beside all critical thinking questions. Teamwork will be required to answer these questions.

WEATHER STATION 1
WEATHER MEDIA CENTER

At this station you will learn about weather forecasting by making observations from the newspaper's weather report and by listening to a NOAA weather radio.

NEWSPAPER: Using the **FIVE DAY FORECAST** at the top of today's newspaper weather map that is on the table, find the data to complete the table below.

Three Day Forecast for Miami	Today	Tomorrow	Day after tomorrow
Sky condition (sunny, cloudy, etc)			
HIGH temperature			
LOW temperature			
Wind direction			
Wind speed			

Look at the MAP OF THE UNITED STATES and find the symbols for fronts.

1. Are there any fronts in Florida? ____ If yes, what kind? (circle one) WARM COLD STATIONARY

Find the SUNBURN ADVISORY.

2. What is the maximum safe exposure for a high-level risk person? _____

Find the MARINE OUTLOOK.

3. In Miami Harbor, when is the next high tide? _____ Next low tide? _____



4. Who would find the marine outlook important? _____

WEATHER RADIO: Turn on the weather radio and listen for a few minutes to become familiar with the information being broadcast. In the table below, place a check next to any weather and or marine forecast terms you hear discussed on the radio. Turn off the radio when finished.

Terms	Check	Terms	Check
temperature		seas	
humidity		bays and inland water	
pressure		precipitation	
winds		forecast	
lightning		ultraviolet index	
clouds		rain	
chance of thunderstorms		moderate chop	
sky condition		barometer	
sunrise		showers	
sunset		mostly sunny	
high tide		tropical storm	
low tide		hurricane	

When finished, turn to page 2, the "Relative Humidity" Station.

WEATHER STATION 2 RELATIVE HUMIDITY

The amount of water vapor in the air is called humidity. Relative humidity is the amount of water vapor in the air at a certain temperature; warmer air can hold more water vapor than cold air. If the relative humidity is 50%, then the air is holding half the amount of water vapor it is capable of holding. If the relative humidity is 100%, then the air contains all the water vapor it can possibly hold.

It is easy to find relative humidity using the **hygrometer** on the table by reading the number at the end of the pointer.

1. **What is the relative humidity reading on the hygrometer?** _____ %

A **sling psychrometer** (Sigh-krom-a-ter) also measures relative humidity, but its use involves several steps. Follow the directions on the table for using the two sling psychrometers. Two people in your team should perform the activity at the same time and in the same manner, so that similar readings are obtained. Record both the wet and dry bulb temperatures and then follow the directions on the table to calculate the relative humidity.

Psychrometer	Dry Bulb Temperature	Wet Bulb Temperature	Relative Humidity
Student 1			
Student 2			

2. **Find the average relative humidity (add two relative humidities above, divide by 2)** _____ %

3. **Is the reading from the hygrometer** (circle one) **higher than** **lower than** **the same as** the average relative humidity you calculated using the sling psychrometers?



4. **Which instrument do you think may give you a less accurate reading? (Hint: Think about the number of steps you must follow to use each one.)** (circle one) **hygrometer** **sling psychrometer**
Why? _____

5. **Does today's relative humidity feel "comfortable" to you?** **YES** **NO**
Why, or why not? _____



6. **What does your body do to cool off when temperatures and humidities are higher than those in your "comfort zone?"** _____



7. **What does your body do to warm up when temperatures and humidities are lower than those in your "comfort zone?"** _____

When finished, turn to page 3, the "**Wind**" Station.

WEATHER STATION 3 WIND

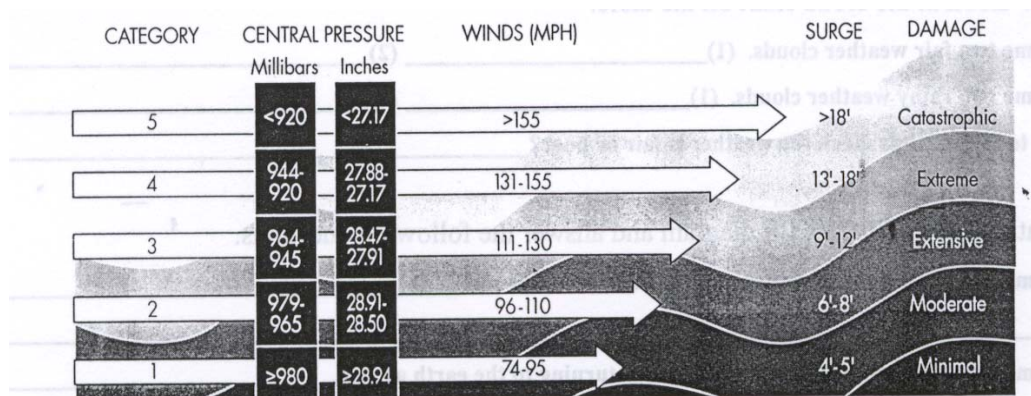
Wind is air in motion. It is caused by the unequal heating of the earth's land and water surfaces, which causes differences of pressure in the atmosphere. Follow the directions on the table for using the **TurboMeter** to record the wind speed in miles per hour.

1. **Wind Speed (MPH)** _____

A **hurricane** is a powerful tropical cyclone (rotating storm) with winds *over 74 miles per hour*. Using the hurricane plotting chart, follow the track of Hurricane Katrina in 2005. Record in the chart below Katrina's coordinates in latitude and longitude for each of the dates shown (a key to latitude and longitude is above the map).

DAT(11:00 PM)	LATITUDE	LONGITUDE
Aug. 23, 2005		
Aug. 24		
Aug. 25		
Aug. 26		
Aug. 27		
Aug. 28		
Aug. 29		

Hurricanes are classified according to both the intensity of the winds and the damage produced by the storm. The method used to measure the intensity and damage caused by a hurricane is called the Saffir-Simpson Scale which is shown below. This system categorizes storm intensity on a scale of one to five.



2. **What category hurricane has winds of 111-130 MPH?** _____

3. **What category has a central pressure of <920 millibars?** _____

4. **Hurricane Hugo in 1989 was a Category 4 hurricane. What type of damage did it cause?** _____

5. **Hurricane Andrew in 1992, Hurricane Camille in 1969 and the Florida Keys Hurricane of 1935 are the only Category 5 hurricanes to strike the United States. What was the storm surge?** _____

When finished, turn to page 4, the “Clouds and Precipitation” Station.

WEATHER STATION 4
CLOUDS AND PRECIPITATION

At this station, we will learn about different types of clouds and record the cloud types present in the sky today as well as record whether there has been any precipitation (rain).

Observe the sky in all directions as well as overhead. Using the CLOUD CHART on the table, determine the kind of clouds you see. Draw the clouds in the box below. If there are no clouds, write "no clouds" for today's cloud type, and go on to question 1.

TODAY'S CLOUD TYPE _____

1. What is the current CLOUD COVER? (circle one)

CLEAR PARTLY CLOUDY MOSTLY CLOUDY OVERCAST

Some types of clouds form at high altitudes, while others form at low altitudes. Look at the CLOUD CHART on the table to answer the following questions.

2. Name a high altitude cloud. _____

3. Name a low altitude cloud. _____

Some types of clouds are associated with rain while other types are considered "fair-weather" (sunny weather) clouds.

4. Name a fair weather cloud. _____

5. Name a rainy weather cloud. _____

6. Do TODAY'S clouds mean the weather will be fair or rainy? (circle one) FAIR RAINY

7. According to the cloud chart, what is another factor other than cloud cover that will determine whether it will be fair or rainy? _____

Look at the WATER CYCLE diagram and answer the following questions.

8. Name two ways water is returned from the land to the air. _____

9. Name two places where RUNOFF goes after returning to the earth as rain. _____

Follow the directions on the poster for reading the RAIN GAUGE.

10. According to the rain gauge, how much rain has fallen today? _____ inches.

11. Based on your answer to Question 6, did you expect rain today? YES NO

When finished, turn to page 5, the "Air Pressure" Station.



WEATHER STATION 5 AIR PRESSURE

Air (barometric) pressure is the force exerted by the weight of the air above us. This weight creates a force on you much like the weight or force on a diver at the bottom of the ocean. The **barometer** is an instrument that measures changes in air pressure.

Read the directions on the poster for reading the **aneroid** ("without liquid") **barometer**. Look at the aneroid barometer on the table, and answer question 1 below.

1. What is the current barometric pressure in millibars (mb)? _____

Hurricanes are areas of very low pressure (below 1000mb.) The lower the air pressure, the more intense the hurricane.

Look at the graph called "Air Pressure During Hurricane Katrina" and answer the following questions.

2. On what day was the air pressure the highest? _____

3. What was the air pressure on that day? _____

4. Hurricane Katrina hit New Orleans on August 29th. Was Katrina more or less intense the day before it hit New Orleans? (circle one) More Less

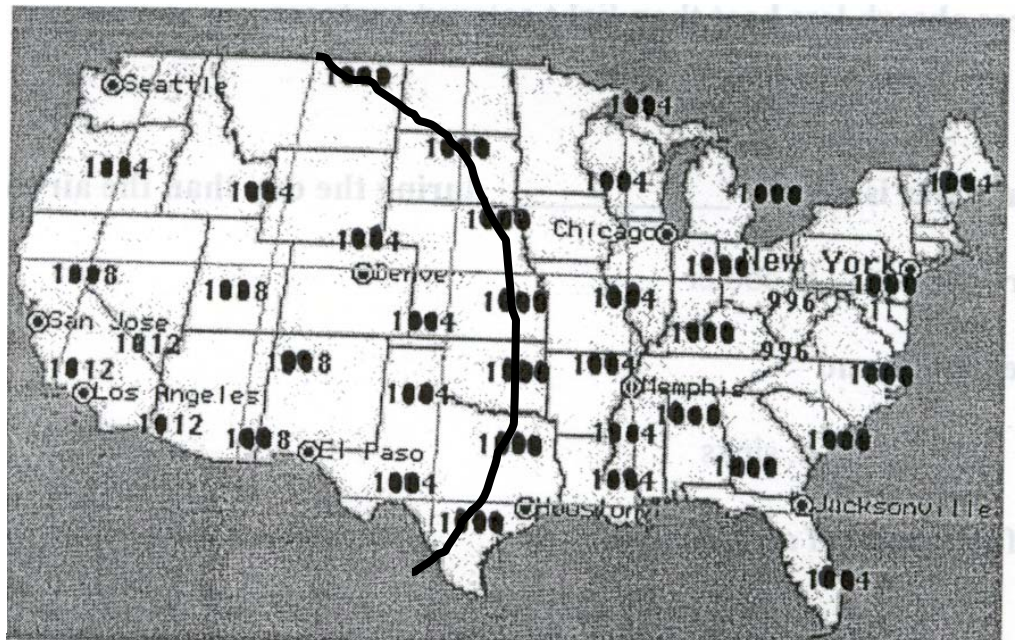
5. Explain your answer to #4. _____

6. If Katrina had hit New Orleans on August 28th, do you think it would have caused (circle one) more or less damage?

7. Explain your answer to #6. _____



Look at the *sample* weather map on the table. The thick black lines are called isobars. These lines connect locations of equal barometric pressure and form sets of curves that do not cross each other. On the map to the right (a different map than the sample map), use the yellow highlighters to draw in the isobars by connecting numbers of equal pressure. The first isobar is drawn for you.



Isobars can be used to identify "Highs" and "Lows". The pressure in a high is greater than the surrounding air and usually brings clear, sunny weather. The pressure in a low is lower than the surrounding air and usually means cloudy or rainy weather. On the map above, label with an "H" the center of a high pressure area, and label with an "L" the center of a low pressure area.

When finished, turn to page 6, the "Every Picture Tells a Story" Station.

WEATHER STATION 7
RAIN OR SHINE

Put on headphones. **Click on Scenes 10 – 18. Click on picture 18** in the lower right hand corner of the screen. While watching the DVD, answer the following questions.


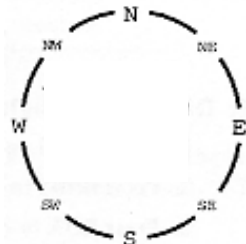
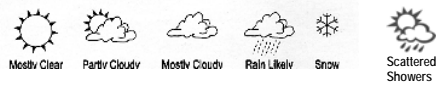
1. **Rather than heating the air directly, sunlight heats the ground first, and the ground then heats the air.**
a. TRUE b. FALSE
2. **Dark surfaces absorb less heat than light colored surfaces.**
a. TRUE b. FALSE
3. **The air over water is usually _____ during the day than the air over land.**
a. warmer b. cooler
4. **Heated air expands and**
a. rises b. sinks
5. **A large uniform body of air is called**
a. a front b. an air mass c. a thunderstorm d. a tornado
6. **The boundary between 2 air masses is called a:**
a. edge b. front c. thunderstorm d. line
7. **A cold front usually brings cool, dry weather, but sometimes causes:**
a. hurricanes b. snow c. tornadoes
8. **Which moves faster?**
a. a cold front b. a warm front
9. **What instruments do meteorologists use to predict the weather?**
a. computers b. satellites c. weather balloons d. all of these

Before moving to the next station, click on the “Menu” button.

When finished, turn to page 8, the “Weather Monitor” Station.

WEATHER STATION 8 THE WEATHER MONITOR

The “Weather Monitor” collects information about the weather from the **Weather Station** set up outside. Using the poster on the wall to help you find the information on the computer screen, fill in the data table below.

Time	Date	Moon Phase (Circle one)			
Outside Temperature °F	Inside Temperature °F	Outside Humidity %	Inside Humidity %		
Dew Point °F		Heat Index °F			
Wind Chill °F		Wind Speed mph			
CURRENT Rainfall Day in	CURRENT Rain Rate in	Barometer mb			
Sunrise _____ AM Sunset _____ PM	Forecast (Circle one)				
					Wind Direction (use an arrow)

At the top of the screen, click on the 5th icon from the left. (The icon with 2 small graphs.) If the graph is not showing the current time on the horizontal axis, then click on the arrow at the bottom right of the scroll bar to move the graph to the current time. One click moves the graph forward one hour.

1. What does the red line represent? _____
2. What does the blue line represent? _____

Read the following paragraph before answering questions 3 – 6.

Dew point is the temperature at which the atmosphere becomes 100% saturated (filled) with water. **If the outside temperature falls to the dew point temperature, water vapor in the air will condense, and dew will form on the windows or grass.** The dew evaporates once the outside temperature rises above the dew point.

3. On the graph shown on the computer screen, the outside temperature is higher than the dewpoint temperature. Under these conditions, would dew be able to form?
 Yes No



4. Why or why not? _____

5. If both the dew point and the outside temperature were the same, what would happen to the water vapor in the air?



6. If there was dew on the bus window early this morning but it is now gone, what happened to it? _____

At the top of the screen, click on the 3rd icon from the left to go back to the first screen.

When finished, turn to page 9, the “Climate” Station.

WEATHER STATION 9 CLIMATE

How does one distinguish weather from climate? One simple way to think of it is that climate is what we expect; weather is what we get. To describe climate, researchers look at the average weather over a number of years in a particular region during a particular season. In this activity, you will be comparing the subtropical climate in Miami to a desert climate in Phoenix, Arizona by using temperature, precipitation and relative humidity as your data.

1. Click on the book with the title “U.S. Climate Data.”
2. Click on the bar at the bottom right that says “List All Cites.”
3. Scroll down and click on **Miami, FL**. (Cities are listed alphabetically by state.)
4. Click on the bar that says “City Information.” There is a **yellow arrow** pointing to the month of January indicating that the information listed is for that month.
5. Record the **high temperature**, **precipitation (rain)** and **relative humidity** in the box for January in the data table below.
6. Click on March and record the data. Repeat for May, July, September, and November.

Miami	January	March	May	July	September	November
High Temperature						
Precipitation (rain) in Miami (inches)						
Relative Humidity (%)						

7. Click on the small square above the word “Miami.”
8. Scroll up to Phoenix, AZ and click on this city. Click on “City Information.”
9. Find and record the temperature, precipitation (rain) and relative humidity for each month.

Phoenix	January	March	May	July	September	November
High Temperature						
Precipitation (rain) in Phoenix (inches)						
Relative Humidity (%)						

Using the data above, answer the following questions.

1. What city has the highest temperature for any month? (circle one) MIAMI PHOENIX
2. What city has the highest rainfall for any month? (circle one) MIAMI PHOENIX
3. What city has the highest humidity for any month? (circle one) MIAMI PHOENIX
4. Describe the climate in Miami? (circle all that apply) HOT RAINY HUMID DRY
5. Describe the climate in Phoenix? (circle all that apply) HOT RAINY HUMID DRY



6. How would your use of water be affected if the climate in Miami changed to that of Phoenix? _____

Click on the “Home” button to return to the main screen.

When finished, turn to page 10, the “Weather Wizards” Station.

WEATHER STATION 10
WEATHER WIZARDS

Weather Wizards contains experiments that ask you to make adjustments to the weather to solve a problem. You will use an “**atmosphere transmogrifier**” to solve a problem involving thunderstorms in the city of Sherman, Florida. Begin as a **Novice Weather Wizard**. Read the directions below.

- A. Put on headphones. To listen to a weather newscast and look for the “Desired Conditions” for preventing a thunderstorm, first click on the **Novice** button. Next, click on **Thunderstorms** from the Experiments List.
- B. Read the Objective and First Challenge. Click on the answer you think is the best. If your response is correct, answer question 1 below. Then click on **Continue** to go to the next challenge. If incorrect, click on **Continue** to try again until you get the correct answer. Do the same for the next two challenges. After answering question 3 correctly, don’t click on the Continue button. Instead, read the directions in **red** at the bottom of the screen. Click on the flashing **Level** button at the top right of the screen to show the weather map.

- 1. You can reduce the likelihood of lightning by
 - a. reducing the humidity
 - b. increasing the wind
 - c. reducing the temperature
 - d. increasing the cloud cover
- 2. Thunderheads are
 - a. cumulus clouds
 - b. cirrus clouds
 - c. stratus clouds
 - d. cumulonimbus clouds

Remember, after answering question 3 correctly, don’t click on the Continue button. Click on the flashing **Level** button at the top right of the screen to show the weather map.

- 3. Thunderstorms are usually associated with
 - a. strong low pressure systems
 - b. weak low pressure systems
 - c. moderate high pressure systems

You are now an **Advanced Weather Wizard!** Your objective now is to change different weather factors to prevent a thunderstorm from hitting the city of Sherman, Florida. Read the directions below. Use your answers from the questions above to decide how to make adjustments to the weather.

- C. Your weather control panel is below the map. If you decide to remove the low pressure system, click on the yellow **LOW** button. If you decide to add a high pressure system, click on the green **HIGH** button. Click and drag the pressure system if you decide to move it to a new location.
- D. If you decide to change the temperature, moisture, or strength of the pressure systems, slide the red buttons to the right (to increase) or left (to decrease.)
- E. If you decide to change the cloud cover, click on one of the sky pictures.
- F. After making all your desired adjustments, click on the **Engage** button (the **orange** button to the far right) to start the “atmosphere transmogrifier.” Watch to see if your objective has been achieved.

- 4. Was your objective achieved? **Yes** **No** (If yes, click on **Continue** for the weather newscasters final report. If no, click on **Continue** to make adjustments until time runs out or you achieve your objective.)



- 5. If a thunderstorm didn’t hit, explain why your adjustments worked. If a thunderstorm did hit, explain why? (Hint: Use information from the weather newscasters’ final report.) _____

When finished, turn to page 1, the “**Weather Media Center**” Station.

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