

# Forecasting Activity Key

\*\*\* For ease of use during class the Teacher Key pages are numbered the same as the Student Activity Book pages.

## I. Introduction

How often do you watch the weather on TV or listen on the radio for the weather forecast? The weather affects everything from afternoon swim practice to attacks on enemy forces during wars.

Weather forecasting used to be thought of as witchcraft. Those caught forecasting were punished. Today, we rely heavily on weather forecasters to help us plan our days and prepare for life-threatening conditions.

Some people "feel in their bones" that a storm is coming. Some people watch the animals and plants to know when it is about to storm. Those of us with televisions and radios don't have to wait for sparrows to fly by; we can just watch or listen to the weather.

### Get Info Objectives

1. Draw examples of weather map symbols.
2. Define common weather terms.
3. Explain weather systems.

### Gather Data Objectives

1. Interpret temperature, wind, pressure, and cloud maps.
2. Draw cloud positions based on pressure maps.
3. Forecast the position of clouds three days from today.

### Application Objectives

1. Relate temperature maps to pressure maps.
2. Relate pressure maps to wind maps.
3. Relate wind chill to wind and temperature maps.

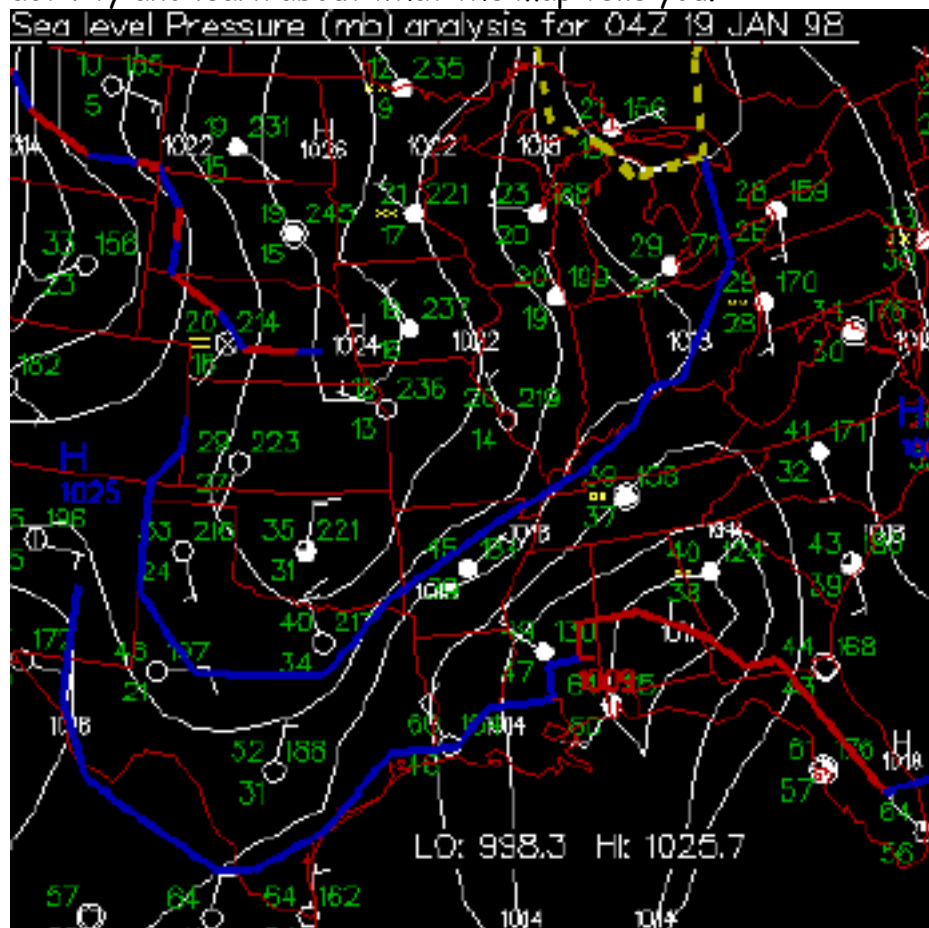
Before doing anything else, add the NOAA Research "Forecasting" page to Bookmarks or Favorites on your web browser.

## II. Get Info

The job of weather forecasters is to get information on weather events and pass it on to you. This is so you can plan your day, week, or plan for severe weather such as tornadoes, hurricanes, or thunderstorms.

It has been said that a picture is worth a thousand words. Below is a weather map. Just think of how many words it would take to describe all the information in this picture.

To understand the picture and all the information it has, start the activity and learn about what the map tells you.





## A. Weather Symbols

- Click on the symbols site.
- Read the chart and fill in the following common symbols.



### 1. Common Weather Symbols Chart

	Light	Moderate	Heavy
Rainfall	□ □	□ □ □	□ □ □ □ □
Snow	× ×	× × ×	× × × × ×
Thunderstorm	T ⚡	X	T ⚡
Lightning	⚡	X	X



- Click "Back" to return to the Forecasting "Get Info.1" web page.

## B. Cloud Cover Symbols

- Click on the "Project Cloud Cover" site.

### 1. How would you show the skies were about 50% cloudy?

Fill in one-half of the circle on the wind barb.

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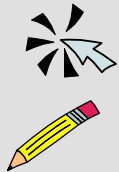


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- Click "Back" to return to the Forecasting "Get Info.1" web page.

### C. Storm Structure



- Click on the "Project Wind Speed Symbols" site.

1. How do you show the direction that the wind is blowing from?

The wind direction is shown by the pole (wind barb) pointing upwind (the direction the wind is blowing from).



2. What is the relationship between the length of the lines on the wind barb and the speed that the lines indicate?

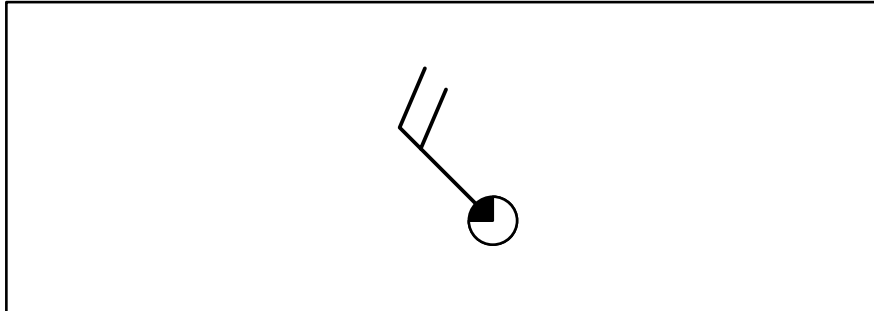
Short lines are 5 knots; long lines are 10 knots. The long lines are added to the pole as necessary to get up to 40 knots. Pennants are 50 knots.

3. Write a sentence describing a wind barb showing that a southerly wind is blowing about 15 knots with clear skies.

A wind barb showing clear skies has an unshaded circle with a pole sticking out to the south with a long string at the end of the pole and a short string towards the circle, both of which are pointing to the west.



4. Draw a wind barb showing a northwesterly wind blowing at 20 knots with 25% cloud cover.



5. Convert 20 knots to miles per hour.

$$\frac{20 \text{ knots}}{1} \times \frac{1.15 \text{ mph}}{\text{knot}} = 23 \text{ miles per hour}$$

6. Draw a wind barb showing 86 miles per hour southwesterly wind and overcast skies. (First, convert miles per hour to knots.)

$$\frac{86 \text{ mph}}{1} \times \frac{1 \text{ knot}}{1.15 \text{ mph}} = 75 \text{ knots}$$



- Click "Back" to return to the Forecasting "Get Info.1" web page.
- Click "Forward" at the bottom of the screen.

## D. Isobars

- Click on the "Project Isobars" site.

1. What are isobars?

Isobars are lines connecting points of equal pressure.

2. How can we use isobars to show us the direction of the wind?

Stronger winds are associated with larger pressure gradients. Larger gradients are indicated by having lines closer together.

- Click "Back" to return to the Forecasting "Get Info.2" web page.

## E. Weather Maps

- Click on the "Weather Maps" site.

- Read Section B and answer the following question.

1. How do weather maps help meteorologists?

Weather maps summarize what is happening in the atmosphere at a certain time. Forecasters can use maps of different levels of the atmosphere to conceptualize a three-dimensional picture of what the atmosphere is doing.

- Click "Back" to return to the Forecasting "Get Info.2" web page.



## F. Weather Systems

- Click on the "Weather Systems" site.
- Read Sections A and B.

1. What causes weather systems?

Warm air rises until it hits air that is the same temperature, and cold air sinks until it hits air that is the same temperature. The combination of warm rising air and cold sinking air results in what we call weather systems.

2. Why do clear skies usually mean it's going to be cold?

Areas of high pressure tend to be clear and cold.

3. What types of pressure area (high or low) would you expect to be in during a thunderstorm?

Low pressure

4. Does air in a high pressure area move towards a higher pressure area or towards a low pressure area?

Air sinks in high pressure areas until it hits the ground, then it moves along the surface of the earth away from the high pressure to a low pressure area.

- Click "Back" to return to the Forecasting main page or choose "Forecasting" from Bookmarks or Favorites on your web browser..
- Click "Gather Data".



### III. Gather Data

#### A. Current Atmospheric Pressure at Sea Level

- Click on the "Weather Graphics" site. Add this page to your Bookmarks or Favorites so you can use it later.
- Scroll to "Sea Level Pressure - Isobars."

1. What is the pressure where you live? (If you have difficulty naming the states, look at the other map.)  
Today's pressure is Answer will vary daily millibars.

2. What state(s) has the highest pressure on the map?

Answers will vary daily

3. What state(s) has the lowest pressure on the map?

Answers will vary daily

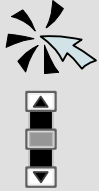
- Close the "Isobars" map and click on "Sea Level Pressure with Wind Vectors" map.

4. What states should have the highest winds?

The answer will vary daily, but the states with the most isobars will have the highest winds because they have the highest pressure gradient.

5. What direction are the highest winds blowing from?

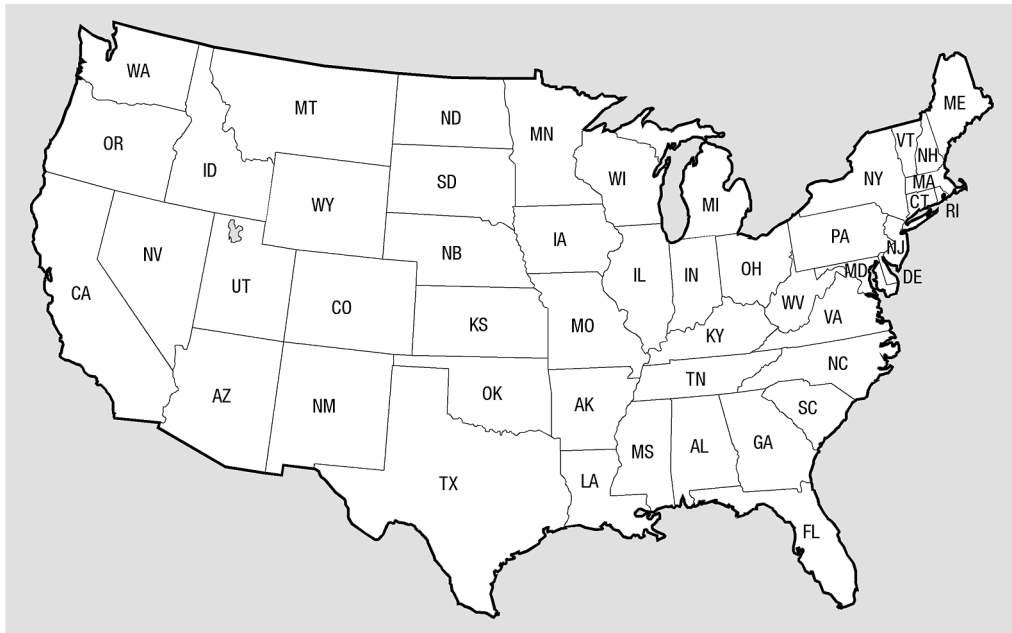
Answers will vary daily







6. What is the interval (pressure difference) between two adjacent (side by side) isobars? usually 2, sometimes 4 millibars
7. Using your knowledge of pressure and clouds, draw clouds on the U.S. Continental map where you think it would be cloudy.



Clouds will be found at locations with lowest pressure.



- To check your work, click on "Sea Level Pressure with IR Satellite & Wind Vectors" map.
- Close the "Sea Level Pressure with IR Satellite & Wind Vectors" map to return to the "Weather Graphics" site.

### **B. Current Temperature at Sea Level**



- Click on "Surface Temperature - Temperature Contours" map.

1. Where is the coldest temperature on the map?

Answers will vary daily.





2. Where is the hottest temperature on the map?

Answers will vary daily. \_\_\_\_\_

- Close the "Surface Temperature - Temperature Contours" map.

### C. Wind Maps



- Click on "Surface Observations - United States" map.
- To read this map, remember how wind barbs are drawn to show the direction of the wind.

1. Where is the wind blowing the strongest?

Answers will vary daily. \_\_\_\_\_

2. Where is an area of calm air surrounded by wind?

Answers will vary daily. \_\_\_\_\_

- Close the "Surface Observations - United States" map.
- Click "Back" to return to the Forecasting "Gather Data.2" page.
- Scroll to the bottom of the page and click "Forward" to go to the "Gather Data.3" page.

### D. Rainfall



- Click on the "Daily Weather Map - Rainfall" site.
- Click on the maps image.
- Scroll to the bottom of the page and click on the "24-hr Precipitation" map.

1. How many inches of rain have fallen in your area during the past 24 hours? \_\_\_\_\_ various \_\_\_\_\_ in





2. What is the relationship between the areas where it is raining and the pressure in those areas?

The lower the pressure, the more likely it will be raining.

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- Click "Back" until you return to the Forecasting "Gather Data.3" page.

### **E. Satellite Cloud Picture**



- Click on the "Satellite Images" site.
- Click on "Visible" in the "East CONUS" column to view the Eastern part of the U.S. (The "CONUS" stands for the continental U.S.)
- Click on "Visible" in the "West CONUS" column to view the Western part of the U.S.



1. Did you draw the clouds where they actually are when you answered Question 7 in "Gather Data, Section A"? yes or no

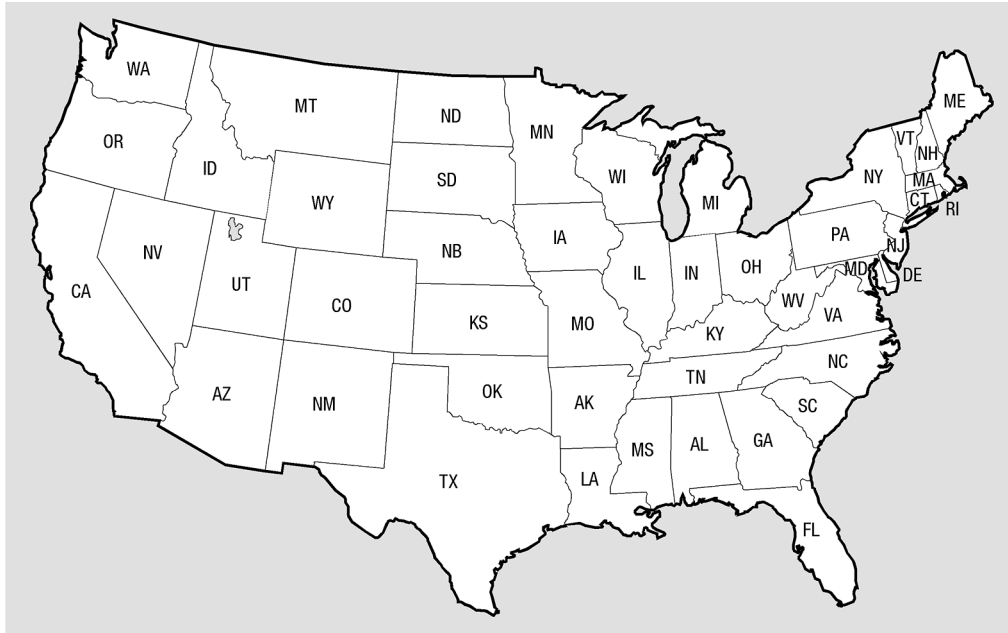


- Click "Back" until you return to the Forecasting main page, or choose "Forecasting" from your Favorites or Bookmarks.
- Click "Application".

## IV. Application

### A. Forecasting

1. Using the information from the maps you have, forecast where the clouds will be in three days. Draw them in their new positions on the map of the United States.



Three days from the time you complete this activity watch the news. Look to see where the clouds actually are to check your answer. You can also go back to the "Satellite Images" site in Gather Data.3 section E and follow the directions to get the day's satellite image.

## B. Wind Direction and Air Masses

1. If you were standing on the edge of a thunderstorm as it begins to form, would the wind be blowing into the storm or out of it, and why? (Review section E in the *Get Info* section if you need help.)

The wind blows into a young thunderstorm because the warm low  
pressure air is rising.

- Click "Forward" at the bottom of the screen.

## C. How Maps Show Relationships among Weather Phenomena

- Select the "Weather Graphics" site from your Bookmarks or Favorites to compare the sea level pressure to wind vectors.

1. How can you estimate the wind speed and direction using the pressure map?

Wind blows from high pressure to low pressure. The greater the difference  
between the highest and lowest pressure, the greater the wind speed.

- Close the "Sea Level Pressure with Wind Vectors" map and then compare the sea level pressure to temperature.

2. How are pressure and temperature related?

Usually higher pressure indicates cooler temperatures, but not always.



- Close the "Sea Level Pressure with Wind Vectors" map and then compare the sea level pressure to clouds.

3. How are pressure and clouds related?

The clouds form in low pressure areas or along frontal boundaries where high and low pressure areas meet.

- Close the "Sea Level Pressure with IR Satellite" map.  
- Click "Forward" at the bottom of the screen.

#### D. Wind Chill

- Click on the "Wind Chill" site.

1. What is wind chill?

Wind chill is the term used to describe the rate of heat loss on the human body resulting from the combined effects of low temperature and wind.

2. How does the wind chill affect your car?

Wind chill can cool it down faster, but not any colder than the actual air temperature.

3. Calculate how cold it feels if the temperature is 10 degrees F and the wind is blowing 15 miles per hour. Wind chill = 18°F



4. Calculate how cold it feels if the temperature is 35 degrees F and the wind is blowing 24 miles per hour. Wind chill = 8 – 9°F



- Click "Back" to return to the Forecasting "Application.3" page.

### E. Use of Maps



1. How does weather forecasting affect people's daily lives?

Answers will vary

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2. How does forecasting affect people's entertainment activities?

Answers will vary

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3. How would forecasting and archived weather knowledge affect planning festivals and other large public gatherings?

Answers will vary. Outdoor entertainment can be cancelled. Planners for the event can use forecasting to plan for bad weather and move the event indoors or under tents. You can dress appropriately for the weather if you know what it will be like.

- Click "Back" until you return to the Forecasting main page or choose "Forecasting" from Bookmarks or Favorites on your web browser.
- Click on "Enrichment.1".



## V. Enrichment Activities

### A. Newspaper Use

1. Collect the weather maps from your newspaper for one week. Glue or staple each one on a sheet of paper. After each day, make a prediction what the weather patterns will be for the next day. Check the weather map to see if you are correct.
2. Collect news articles about weather and its effects on areas and people. Summarize each article.

### B. Observations

1. Record the types of clouds you see each day for five days (or longer). Draw and label each type.
2. Visit this site for pictures and explanations of cloud types:  
<http://vortex.plymouth.edu/clouds.html>.
3. Make a list of all the lyrics or song titles that are about weather.  
- Click "Forward" at the bottom of the screen.

### C. Interviews

1. Interview a meteorologist from a radio or TV station. Develop a list of questions to ask this person over the phone. For example, find out what the job is like, what type of education is needed, and how computers help forecasting.
2. Interview your grandparents or other people about "folk tales" related to weather. For example, some older people say because their bones hurt, they know it's going to rain soon.



## D. Measurements

1. Set up a weather station at home or school. You'll need a thermometer, barometer, anemometer, and hydrometer. Record the weather conditions and make predictions based on the data you collect. For help in taking measurements, go to the site <http://www.4seasons.org.uk/projects/weather/measure.htm>.
2. Record the amount of rainfall in your area for a month. Graph the amount each day on a line graph.

## E. Related web sites

1. Weather Glossary  
<http://www.wrh.noaa.gov/spokane/outreach/school/apxb.htm>
2. Radar Glossary  
<http://www.pa.op.dlr.de/poldirad/docs/glossary.html>
3. Hydrologic (water related) Glossary  
<http://www.crh.noaa.gov/hsd/hydefa-c.html>
4. Reading and Interpreting Weather Phenomena  
[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/maps/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/maps/home.rxml)
5. Weather Charting  
<http://vathena.arc.nasa.gov/curric/weather/graphing/>