March 10 Predicating Weather Reading

<u>Part 1 Directions</u>: Make some predictions on the left side column about each statement. Click **A** for agree or **D** for disagree.

Before Reading	Statement	After Reading
A D	Predicted weather is always correct.	A D
A D	A 40 percent rain prediction means that out of the past 10 days, it has rained on 4 days.	A D
A D	Scientists who look at weather data to make predictions are called meteorologists.	A D
A D	When making predictions, scientists only look at what is happening in their local area.	A D
A D	The current conditions of air pressure, wind, and solar radiation influence the weather prediction for an area.	A D

Part 2 Directions: Read the text and fill out each box as you read.

Weather affects everyone. The clothes we wear, our travel plans, our daily activities—all of these things depend on the weather.

In order to plan our day, we need to know what the weather will be. For this we depend on the work of special scientists known as **meteorologists**. How do meteorologists do their work? How do they predict the weather?

Meteorologists create the weather maps we see in the newspaper or on television.
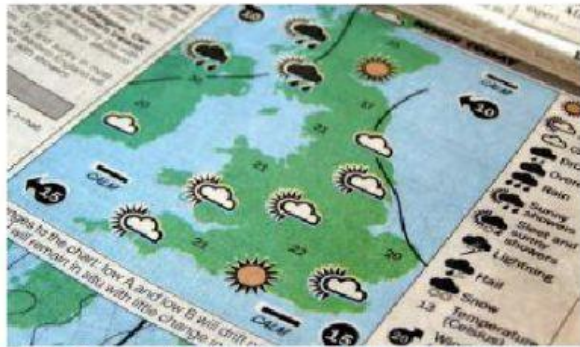
Predicting the Weather

Predicting the weather is like predicting anything. To make a good prediction, it helps to know what has happened before and what is going on right now.

meteorologist- a scientist that studies weather

Let's use baseball as an example. Say a batter steps to the plate and we want to predict if the batter will get a hit or strike out. It helps to know some things. What is the batting average of the player (how often does the player get a hit)? How is the player batting today? What about the pitcher? Has the pitcher been striking out many previous batters? Suppose we know that the batter has a low batting average, and has struck out both previous times at bat during this game. Suppose we also know the pitcher strikes out 7 out of every 10 left-handed batters, and that the player at bat is left-handed. We might predict the batter will strike out, but will he? Maybe yes and maybe no. There are so many other things that might affect the outcome.

Predicting the weather is a lot like predicting the outcome of the baseball player at the plate.

To predict the weather we need to know current conditions. What is the current temperature? How much water vapor is in the air (what is the humidity)? Is there precipitation and cloud cover or is it sunny? What is the air pressure? Is there wind?

Knowing the answers to these questions and others will help us predict the weather. It also helps to know what kinds of weather have happened in the past when conditions were similar.

Predicting the weather is like making other kinds of predictions.

Components of weather:	Weather forecasting tools:

How do meteorologists collect the data they need?

Weather data such as wind speed and direction, humidity, temperature, and precipitation are recorded at weather stations located all over the world. The data is uploaded to satellites for access by meteorologists worldwide.

Weather balloons are launched globally, two times each day to collect data concerning the upper atmosphere conditions by measuring humidity, temperature, air pressure, and wind speed. This data is also shared.

Satellite images show cloud cover and the movement of precipitation across the country. There are three different types of satellites images: infrared radiation, visible light, and water vapor.

- Infrared radiation images indicate which objects are warmer than other objects. The images show warmer objects as darker than cooler objects. This gives meteorologists indications of the relative temperature of different levels of clouds.
- Visible light images are just what they sound like, images of what can be seen by the human eye. This view from space shows the pattern of movement of the cloud cover.
- Water vapor images indicate if an area has high or low humidity. Areas with a high level of water vapor in the atmosphere appear as bright while areas with a low level of water vapor appear as black. Knowing the level of humidity helps the meteorologist predict whether or not it will rain.

Weather radar maps indicate the location, type, and intensity of precipitation that is occurring in an area. Doppler radar data can be analyzed to determine the potential for severe weather to develop.

Weather maps are also created by plotting data such as temperature, wind direction and speed, and atmospheric pressure for weather stations at different locations on the map. By observing changes in these conditions at weather stations over time, or differences between weather stations, we can track weather systems, such as storms and fronts, and predict what they will do next.
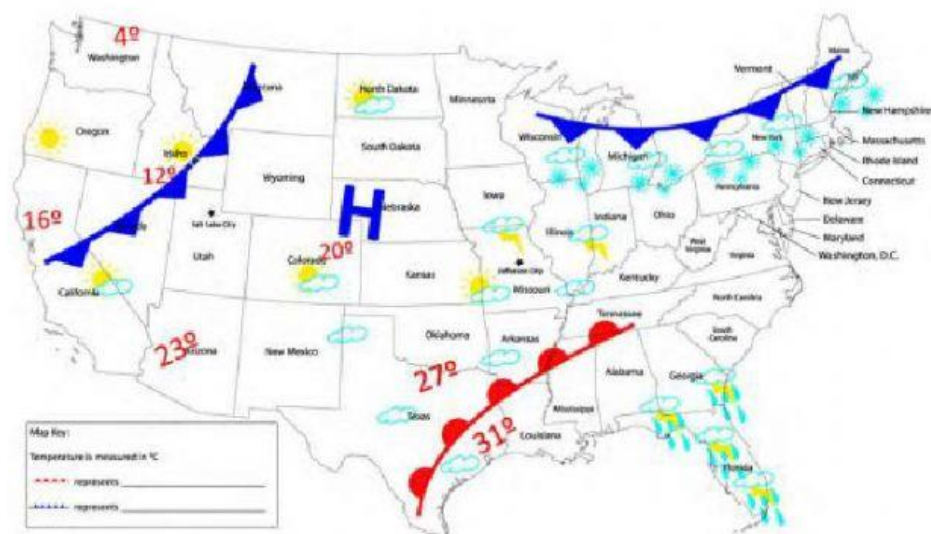
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For example, since we know a cold front occurs when a cold, dry air mass pushes out a warm air mass, we know higher temperatures occur ahead of the front and lower temperatures behind. The cold air pushing out the warm air leads to storms, so stations where there is precipitation can indicate where the cold front is located. The locations of warm fronts are determined using similar indicators such as temperature, wind speed and direction, pressure, and precipitation changes.

Meteorologists use weather maps to keep track of atmospheric conditions. This allows them to understand the large-scale global patterns of atmospheric movement, such as fronts or storms. These weather maps can be used to forecast or predict the weather at smaller scales, like for an individual city, such as Nashville.

Pros of weather forecasting:

Why Weather Predictions Fail

The size and scale of weather predictions are much larger than for a single event, like a batter at bat. There are many conditions to take into consideration. All of these conditions interact with each other in complex ways.

In addition, meteorologists usually need to know conditions over a very large area. Just trying to collect all the needed information is a difficult task.

After collecting huge amounts of data, meteorologists plug all the information into complex formulas, called **algorithms**, that help them predict future weather conditions.

$$F_n = \frac{1}{2N} \sum_{k=0}^{2N-1} f(kt_s)e^{i\pi nk/Nt_s}$$

This is an example of one of the *simpler* algorithms a meteorologist might use.

algorithm- a formula for solving a problem

Even with lots of data and very good algorithms, however, the number of conditions or factors, the complex way they interact with each other, and the large areas covered make it impossible for meteorologists to say exactly what will happen with 100% certainty. They can only tell us what is likely to happen.

Cons of weather forecasting; reasons for inaccuracies include:

We can try to make our own weather predictions by using historical weather data and comparing it to current weather data. Below is a table of various weather conditions for the same location over many days, including specific weather that resulted (did it rain that day or not?). Use the historical weather data to assign a probability of rain for the day we are trying to predict.

Day 1	Day 2	Day 3	Day 4	Day 5
Winds: Easterly **Air Pressure:** High **Clouds:** None	**Winds:** Easterly **Air Pressure:** High **Clouds:** None	**Winds:** Easterly **Air Pressure:** High **Clouds:** None	**Winds:** Westerly **Air Pressure:** Falling **Clouds:** Cumulus	**Winds:** Westerly **Air Pressure:** Low **Clouds:** Cumulus towers **RAIN**
NO RAIN	**NO RAIN**	**NO RAIN**	**NO RAIN**	

TODAY	What is your best prediction for the probability of rain today? Explain.
Winds: Westerly **Air Pressure:** Low **Clouds:** Cumulus towers	

Part 3 Directions: When you are finished, go back up to the statements from Part 1 and fill out the right column with the correct answer.