Friends

Weather and Climate

Name _____

Grade _____ Teacher _____

School _____

✿ CONTENTS:

Do you know the difference between weather and climate?

The main difference between weather and climate is the time scale over which the conditions are described. Weather generally describes the atmosphere during short time frames like hours or days. Climate generally refers to conditions that span months, years, or even decades. One way to remember this is that weather tells us what to wear on any given day, and the climate tells us what kind of wardrobe to own. Knowing this, join me, Arch the Dog, as we explore much more about weather and climate!

Georgia 4-H is a partner in public education and strives to incorporate Georgia Standards of Excellence in the education materials for in-school use. The following Georgia Standards of Excellence are correlated to the content delivery included in this publication.

S4E3. Obtain, evaluate, and communicate information to demonstrate the water cycle.

a. Plan and carry out investigations to observe the flow of energy in water as it changes states from solid (ice) to liquid (water) to gas (water vapor) and changes from gas to liquid to solid.

b. Develop models to illustrate multiple pathways water may take during the water cycle (evaporation, condensation, and precipitation).

S4E4. Obtain, evaluate, and communicate information to predict weather events and infer weather patterns using weather charts/maps and collected weather data.

a. Construct an explanation of how weather instruments (thermometer, rain gauge, barometer, wind vane, and anemometer) are used in gathering weather data and making forecasts.

b. Interpret data from weather maps, including fronts (warm, cold, and stationary), temperature, pressure, and precipitation to make an informed prediction about tomorrow's weather.

c. Ask questions and use observations of cloud types (cirrus, stratus, and cumulus) and data of weather conditions to predict weather events.

d. Construct an explanation based on research to communicate the difference between weather and climate.

Think Green! Not just 4-H Green...but let's help do our part to recycle and reuse. Save this book, reread it or pass it along to a friend. If it's too worn, please recycle it.
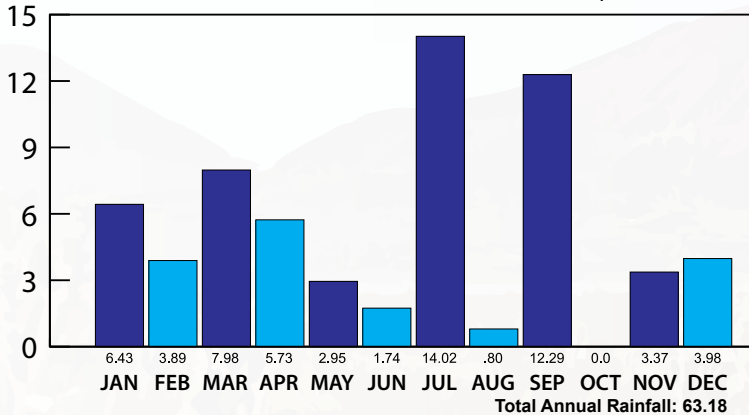
WHAT'S TRENDING WITH WEATHER AND CLIMATE?

A climatologist is a scientist who studies climate, which is the long-term weather conditions of a region, including its patterns, variations, and the factors that influence them. Climatologists create graphs using weather observations that have been collected over long periods of time (at least 30 years). The observations are collected from land-based weather stations, ships, buoys, and satellites passing over Earth. Climatologists study these graphs to identify trends in weather patterns. A trend is a long-term movement in a series of data points. A trend is like a pattern that happens over time. It can go up, down, or stay almost the same.

Please explore the example below and answer the questions provided to learn more about trends in weather patterns.

2024 Total Average Rainfall (Inches)
Atlanta Hartsfield-Jackson International Airport

| Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Inches	6.43	3.89	7.98	5.73	2.95	1.74	14.02	.80	12.29	0.0	3.37	3.98

Total Annual Rainfall: 63.18

1. Which month received the lowest amount of rainfall at the airport? _____

2. Which month received the highest amount of rainfall at the airport? _____

3. How much rainfall did the airport receive in the month of July? _____ inches

4. What are some trends that this data can tell us? _____

_____

Now, let's build our own graph. Create a maximum temperature graph below using the data provided to the right.

Average Maximum Temperature (°F) – Fulton County, GA

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
44.3	53.1	58.8	65.4	74.3	81.5	82.4	82.2	76.3	68.1	59.6	48.8

(Blank graph grid with y-axis 0° to 100° and x-axis Jan through Dec)
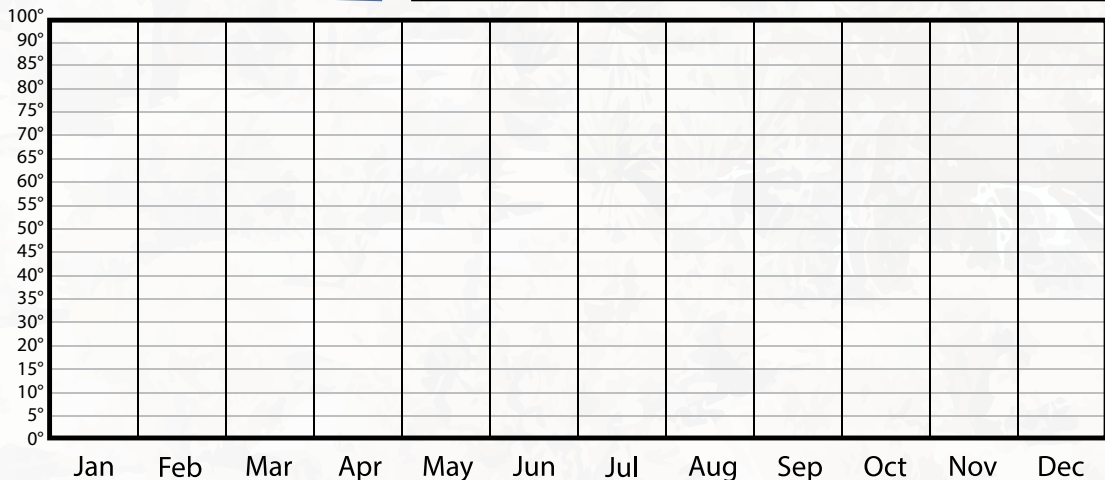
Data provided by the National Atmospheric and Oceanic Administration's National Weather Service.

To learn more or find data for different parts of Georgia, please visit: https://climateandsociety.uga.edu/climate-change/georgia-climate/

GAUGE YOUR KNOWLEDGE

2019 – Tornado Outbreak in Georgia

A total of 14 tornadoes occurred in Georgia on March 3, 2019. A warm front mixed with a low-pressure system and created the perfect conditions for disaster, resulting in 41 tornadoes in the southeast United States. The largest and most damaging tornado was an EF-4, with a recorded windspeed at 140 mph. It originated in Smith's Station, Alabama, and traveled 68 miles to Talbotton, Georgia.

CAN YOU READ A WEATHER MAP?

A meteorologist is a scientist who studies data to understand and predict Earth's atmospheric phenomena — mainly the weather! Meteorologists use symbols on surface weather maps to convey information about weather observations at a particular time. The weather maps in newspapers or on television weather forecasts are simplified versions of these surface maps.

In meteorology, a weather front is a boundary or transition zone between two different air masses with contrasting properties, such as temperature, humidity, and density, that can bring about significant weather changes.

Map Questions

1. What is the coldest temperature recorded on this date? _____

2. What type of front is depicted on the map? _____

3. What type of weather is reported in Texas? _____

Cold Front   **Warm Front**

Stationary Front

Temperature (°F)
32°

Forms of Precipitation

SNOW   RAIN   DRIZZLE   FOG   THUNDERSTORM   HAIL

Weather Conditions

- A warm front is moving from the south to the north.
- The temperature in northern Florida is 75°F.
- The temperature in western Tennessee is 78°F.
- The temperature in eastern North Carolina is 69°F.
- It is raining in southern Georgia.

Examine this fictional map and practice interpreting the information by answering the questions.

36°   40°   48°   51°   32°   45°
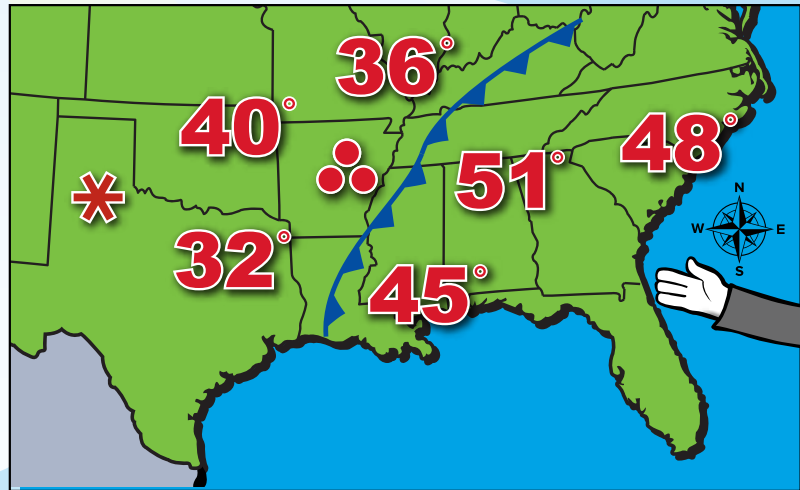
Now it's your turn to be the meteorologist! Create a weather map using the symbols provided to depict the conditions.

Wh
Clou
Loca
Date

GAUGE YOUR KNOWLEDGE

2020 — Midwestern Derecho

A *derecho* is a widespread, long-lived windstorm that is associated with a band of thunderstorms. On August 10-11, 2020, wind speeds of over 70 miles per hour hit the midwestern United States. This powerful derecho caused over 11 billion dollars in damages, with the worst damage being to the corn and soybean crops.

WHAT'S A CLOUD
GOT TO DO WITH WEATHER?

Clouds are a collection of millions of tiny water droplets or ice crystals that are formed from condensation. As warm water vapor rises into the air, it cools and turns back to water droplets. The droplets attach themselves to dust in the air forming a cloud.

Clouds can indicate good weather or bad weather, can offer relief from direct sunlight, and even provide precipitation. Scientists recognize ten basic types of clouds that are defined by their height as either high-level clouds, mid-level clouds, or low-level clouds.

Cirrus
high thin cloud occurring as silky strands and composed of ice crystals

Stratus
low clouds that occur as a uniform gray layer stretching from horizon to horizon; they may produce drizzle, and where they intersect the ground, they are classified as fog

Cumulus
clouds that develop as a consequence of the updraft in convection currents; resemble huge puffs of cotton floating in the sky

For more information about the ten basic cloud types, visit https://www.noaa.gov/jetstream/clouds/ten-basic-clouds

Use the spaces provided to record your own observations about the clouds you see over time. Try making and recording observations for several days, and think about what kinds of clouds you see and what they might indicate about the weather conditions. Be sure to record the location, date, and time you observe each type of cloud.

Which clouds do you see?
Cloud Type: _____

Location: _____

Date: _____ Time: _____

Draw your cloud:

Which clouds do you see?
Cloud Type: _____

Location: _____

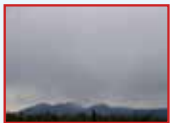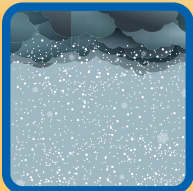Date: _____ Time: _____

Draw your cloud:

Which clouds do you see?
Cloud Type: _____

Location: _____

Date: _____ Time: _____

Draw your cloud:

Which clouds do you see?
Cloud Type: _____

Location: _____

Date: _____ Time: _____

Draw your cloud:

GAUGE YOUR KNOWLEDGE

2021 – North American Winter Storms
In February 2021, multiple winter storms caused widespread damages across the United States, Canada, and Mexico. These storms caused over 195 billion dollars in damage. Texas was one of the hardest hit areas, where millions of people were left without power and faced shortages of food, water, and heat.

TOOLS OF THE TRADE

Scientists use a variety of instruments to measure and study the weather.
Can you match up the weather instruments below with their definitions?

1. _____ An instrument used to measure the water vapor content of the atmosphere

2. _____ An instrument that measures the speed or force of the wind

3. _____ An instrument for measuring rainfall

4. _____ An instrument for measuring temperature

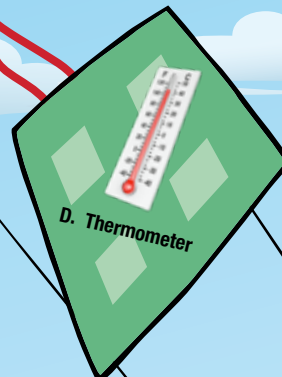5. _____ An instrument used to measure atmospheric pressure
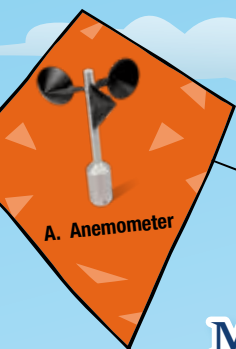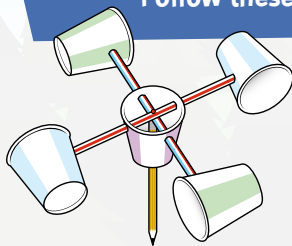
E. Psychrometer

A. Anemometer

B. Barometer
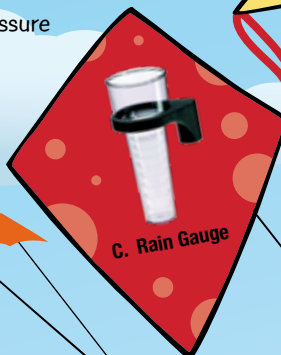
C. Rain Gauge

D. Thermometer

MAKE YOUR OWN WEATHER INSTRUMENT

As you learned above, anemometers are instruments that measure the speed or force of the wind.
Did you know you can make your own anemometer?
Follow these simple instructions below to get started being a weather scientist!

1. Take four of the paper cups and use the paper punch to punch one hole in each, about a half inch below the rim.

2. Take the fifth cup and punch four equally spaced holes about a 1/4 inch below the rim. Then punch a hole in the center of the bottom of the cup.

3. Take one of the four cups and push a soda straw through the hole. Fold the end of the straw and staple it to the side of the cup across from the hole. Repeat this procedure for another one-hole cup and the second straw.

4. Slide one cup and straw assembly through two opposite holes in the cup with four holes. Push another one-hole cup onto the end of the straw just pushed through the four-hole cup.

5. Bend the straw and staple it to the one-hole cup, making certain that the cup faces the opposite direction from the first cup. Repeat this procedure using the other cup and straw assembly and the remaining one-hole cup.

6. Align the four cups so that their open ends face in the same direction either clockwise or counter-clockwise around the center cup.

7. Push the straight pin through the two straws where they intersect.

8. Push the eraser end of the pencil through the bottom hole in the center cup. Push the pin into the end of the pencil eraser as far as it will go.

9. Now your anemometer is ready for use!

Materials:
5 three ounce paper cups
2 straight plastic straws
straight pin (or push pin)
pencil with eraser
paper hole punch
stapler
scissors
ruler

Source for Activity: "Forces of Nature: 4-H Aggie Adventures for Kids, Utah State University Cooperative Extension" http://utah4h.org/staffresources/stemcampguides

GAUGE YOUR KNOWLEDGE

2022 – United States Flash Floods
In late July 2022, flash floods broke out across the United States spanning from Las Vegas to Southwestern Virginia. Some places saw record breaking rainfall with over 12 inches in a 24-hour period. This flooding caused widespread damage to agriculture, homes, and businesses.

Director of UGA's Atmospheric Science Program

Photo courtesy of UGA Photographic Services

— Dr. J. Marshall Shepherd is a leading international expert in weather and climate at the University of Georgia (UGA). Dr. Shepherd was the 2013 President of American Meteorological Society (AMS), the nation's largest society in the atmospheric and related sciences. Dr. Shepherd is Director of the UGA's Atmospheric Sciences Program and Full Professor in the Department of Geography. He is the Georgia Athletic Association Distinguished Professor. Dr. Shepherd also hosts a podcast "Weather Geeks." In 2014, Ted Turner and his Captain Planet Foundation honored Dr. Shepherd with its Protector of the Earth Award. He is also the 2015 Recipient of the Association of American Geographers (AAG) Media Achievement award, the Florida State University Grads Made Good Award and the UGA Franklin College of Arts and Sciences Sandy Beaver Award for Excellence in Teaching. In 2015, Dr. Shepherd was invited to moderate the White House Champions for Change event. Prior to working at UGA, Dr. Shepherd spent 12 years as a **Research Meteorologist** at NASA Goddard Space Flight Center and was Deputy Project Scientist for the Global Precipitation Measurement mission, a multi-national space mission that launched in 2014. President Bush honored him on May 4th, 2004, at the White House with the Presidential Early Career Award for pioneering scientific research in weather and climate science. Dr. Shepherd is a Fellow of the American Meteorological Society.

Dr. Shepherd is frequently sought as an expert on weather, climate, and **remote sensing**. He routinely appears on CBS Face The Nation, NOVA, The Weather Channel, and other TV and radio shows. Dr. Shepherd is frequently asked to advise key leaders at NASA, the White House, Congress, Department of Defense, and officials from foreign countries. In 2013, Dr. Shepherd briefed the U.S. Senate on **climate change** and extreme weather. Dr. Shepherd was also instrumental in leading the effort for UGA to become the 78th member of the University Corporation for Atmospheric Research, a significant milestone for UGA.

Dr. Shepherd received his B.S., M.S. and PhD in **physical meteorology** from Florida State University. He was the first African American to receive a PhD from the Florida State University Department of Meteorology, one of the nation's oldest and most respected programs. He is also the 2nd African American to preside over the American Meteorological Society. Dr. Shepherd co-authored a children's book on weather and weather instruments called Dr. Fred's Weather Watch. Dr. Shepherd is originally from Canton, Georgia, and he participated in 4-H programming as a child. Dr. Sheppard was a member of the Poultry Judging and Land Judging Teams. Additionally, he competed in District Project Achievement (DPA) and shared about his favorite topic ... weather! He is married to Ayana Shepherd and has two kids, Anderson and Arissa.

SPOTLIGHT ON CAREERS

Climatologist — **Pam Knox** is a Director of the UGA Weather Network, a network of 86 stations around the state which have been recording weather and climate data starting in 1991. As an agricultural climatologist for the University of Georgia's College of Agricultural and Environmental Sciences, she provides information on climate and agriculture to Extension agents, farmers, businesses, scientists and educators around the Southeast by giving presentations, writing a daily blog, and answering phone and email questions from a wide variety of groups and individuals. Dr. Knox also gives interviews to local newspapers and television and radio reporters about how the current weather and climate are affecting crops around Georgia. Pam's background is in meteorology, math and physics but she has been doing climate work for universities and the National Weather Service for the last 30 years. In her spare time, Pam makes quilts using sewing skills she learned in 4-H in Michigan.

Professor — **Dillion Blount** was a member of the Mitchell County 4-H program as a kid and taught about weather for Project Achievement. He just finished his PhD in Atmospheric Sciences from the University of Wisconsin-Milwaukee. He studied line-end vortex, gravity wave, and environmental flow contributions associated with mesoscale convective systems. During his college career, he has participated in public policy activities, volunteered for the National Weather Service, and visited the Mesoscale and Microscale Meteorology Lab at NCAR on a visitor appointment. Dillion was the Chair of the American Meteorological Society's Board on Student Affairs. Now that he has finished his degree, he is now a college professor at Ohio University. When he is not studying the weather, Dillion really enjoys going to baseball games, being outdoors, hiking, and cooking!

GAUGE YOUR KNOWLEDGE

2023- Hurricane Idalia
On August 26, 2023, Hurricane Idalia made landfall in Florida's Big Bend region as a Category 3 storm. It was the strongest storm to hit the area in more than 125 years with top wind speeds of 125mph. Hurricane Idalia entered Georgia as a Category 1 hurricane. It is estimated that at least 50% of the pecan crop was lost.

IS IT WEATHER OR CLIMATE?

The main difference between weather and climate is the time scale over which conditions are described. Weather generally describes the atmosphere during short time frames like hours or days, and climate generally refers to conditions that span months, years, or even decades.

How do we differentiate between weather and climate?

Label these twelve statements as either WEATHER (W) or CLIMATE (C).

1. _____ A hurricane makes landfall along the West Coast of Florida at 2:00 p.m. on Saturday.
2. _____ The drought associated with the Great Dust Bowl in the 1930s (an extended period during with an extreme deficit in precipitation).
3. _____ The amount of precipitation measured over the course of a year (annual rainfall).
4. _____ A tornado staying on the ground for four hours and tracking 180 miles.
5. _____ A clear nighttime sky in the summer.
6. _____ A geological period, the ice age, during which Earth exhibited a reduced global temperature and an increased presence of large glaciers and ice sheets.
7. _____ A heat wave affects New York City for 3 days.
8. _____ The state of Georgia experiences a humid subtropical weather patterns with most of the state having mild winters and hot summers.
9. _____ An overnight freeze damages the strawberry crops in California.
10. _____ The Amazon Rainforest is very humid. Over 100 inches of rain falls per year.
11. _____ The greater part of the Australia is desert or semi-arid. Temperatures are generally warm, and the region receives little precipitation.
12. _____ An afternoon thunderstorm passes through Portland on Tuesday.

Weather: 1, 4, 5, 7, 9, 12
Climate: 2, 3, 6, 8, 10, 11

WEATHER VOCABULARY

In the Meet the Experts feature, you read about three people whose careers center around weather and climate. You may have been introduced to some cool new vocabulary. Take a closer look at these words to learn more.

Agricultural Climatology is the study of climate as to its effect on crops.

Climate Change is a long-term change in the earth's climate, especially a change due to an increase in average atmospheric temperature.

Physical Meteorologist is an individual that studies optical, electrical, acoustical and thermodynamic phenomena in the atmosphere, including the physics of clouds and precipitation.

Research Meteorologist is an individual that studies more specific areas of weather like severe weather or climate change.

Remote Sensing is the collection of information about an object without being in direct physical contact with it, gathering data with radar or infrared photography.

Weather Forecasting is the prediction of what the atmosphere will be like in a particular place by using technology and scientific knowledge to make weather observations.

References for Weather Vocabulary: http://www.nssl.noaa.gov/people/jobs/careers.php https://glossary.ametsoc.org/wiki/Welcome https://www.weather.gov/otx/Full_Weather_Glossary#P

**Thank you for taking time to review this publication with your child.
Please help your 4-H leader know that you have learned more about Georgia 4-H.**

_____   _____
Parent/Guardian Signature   Date

REFERENCES AND RESOURCES