Test Creation Project: 4th Grade Weather

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TLT 405: Principles and Applications of K-12 Assessments

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Standards and Unit Description

PA Content Standards and Assessment Anchors

- Standard 3.3.3.A4. Connect the various forms of precipitation to the weather in a particular time and place.
  - Assessment Anchor S3.D.2: Weather, Climate, and Atmospheric Processes
    - Anchor Descriptor S3.D.2.1: Identify basic weather conditions and how they are measured
    - Anchor Descriptor S3.D.2.1.1: Recognize that clouds have different characteristics that relate to different weather conditions.
    - Anchor Descriptor S3.D.2.1.2: Describe how weather variables (i.e., temperature, wind speed, wind direction, and precipitation) are observed and measured.
    - Anchor Descriptor S3.D.2.1.3: Identify appropriate instruments to study and measure weather elements (i.e., thermometer [temperature]; wind vane [wind direction]; anemometer [wind speed]; rain gauge [precipitation]).
- Standard 3.3.3.A5. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular time and place.
  - Assessment Anchor S3.D.2: Weather, Climate, and Atmospheric Processes
    - Anchor Descriptor S3.D.2.1: Identify basic weather conditions and how they are measured
    - Anchor Descriptor S3.D.2.1.1: Recognize that clouds have different characteristics that relate to different weather conditions.
    - Anchor Descriptor S3.D.2.1.2: Describe how weather variables (i.e., temperature, wind speed, wind direction, and precipitation) are observed and measured.
    - Anchor Descriptor S3.D.2.1.3: Identify appropriate instruments to study and measure weather elements (i.e., thermometer [temperature]; wind vane [wind direction]; anemometer [wind speed]; rain gauge [precipitation]).
- Standard 3.3.4.A5: Describe basic weather elements. Identify weather patterns over time.
  - Assessment Anchor S4.D.2: Weather, Climate and Atmospheric Processes
    - Anchor Descriptor S4.D.2.1: Identify basic weather conditions and how they are measured
    - Anchor Descriptor S4.D.2.1.1: Identify basic cloud types (i.e., cirrus, cumulus, stratus, and cumulonimbus) and make connections to basic elements of weather (e.g., changes in temperature, precipitation)
    - Anchor Descriptor S4.D.2.1.2: Identify weather patterns from data charts or graphs of the date (e.g., temperature, wind direction, wind speed, cloud types, precipitation).
    - Anchor Descriptor S4.D.2.1.3: Identify appropriate instruments (i.e., thermometer, rain gauge, weather vane, anemometer and barometer) to study weather and what they measure.

Unit Description

The present unit introduces 4th grade students to weather, weather measurement and meteorological inferences. Students learn about weather elements such as precipitation, barometric pressure, wind, temperature and clouds in order to facilitate a thorough understanding about the weather around them and others. Furthermore, students learn about clouds and how they predict weather. Students continue by investigating weather trends for a variety of areas during different times of year and learn how to analyze charts which provide information about weather. Additionally, students form a better understand weather reports and are able to measure weather using appropriate tools and report their findings.

Objectives

1. The student will associate a given season with its probable precipitation type and temperatures by categorizing statements as true or false with 100% accuracy.
2. The student will analyze charts concerning weather by answering questions about the information provided by the chart with 100% accuracy.
3. The student will match air temperature (thermometer), moisture (barometer), wind speed and direction (anemometer, wind vane) and precipitation (rain gauge) with their measurement tools by selecting the appropriate tools to measure each item with 100% accuracy.
4. The student will effectively use weather instruments to measure their environment by using each tool to measure the current weather and report those findings with 95% accuracy.
5. The student will be able to classify different cloud types and their correlated weather patterns by matching weather patterns to predicting cloud types with 100% accuracy.
6. The student will differentiate how air temperature, wind speed and direction, and precipitation measurements affect weather conditions by choosing appropriate answers to questions about pictures of weather conditions with 100% accuracy.

Table of Specifications

Level	Learning Outcome	Weight/Points	Type of Items	Standard(s)
Knowledge	The student will associate a given season with its probable precipitation type and temperatures	5 @ 4 pts each, 20 pts total **20% of test**	True/False	3.3.3.A4 3.3.3.A5
Knowledge	The student will match air temperature (thermometer), moisture (barometer), wind speed and direction (anemometer, wind vane) and precipitation (rain gauge) with their measurement tools	2 @ 5 pts each, 10 pts total **10% of test**	Multiple Choice	3.3.3.A4 3.3.3.A5 3.3.4.A5
		Pre-Requisite	Performance Assessment	
Application	The student will effectively use weather instruments to measure their environment	**100% of performance assessment**	Performance Assessment	3.3.3.A4 3.3.3.A5 3.3.4.A5
Analysis	The student will analyze charts concerning weather	5 @ 6 pts each, 20 pts total **30% of test**	Short Answer	3.3.4.A5
Analysis	The student will be able to classify different cloud types and their correlated weather patterns	5 @ 5 pts each, 25 pts total **25% of test**	Matching	3.3.3.A4 3.3.3.A5 3.3.4.A5
Analysis	The student will differentiate how air temperature, wind speed and direction, and precipitation measurements affect weather conditions	3 @ 5 pts each, 15 pts total **15% of test**	Multiple Choice	3.3.3.A5

Pre-Assessment

Name:_____ Date___/____/_____

Weather PRE-TEST

<u>Multiple Choice:</u> Please answer each question to the best of your ability. Circle the letter of the best answer.

1. Which of the following is a low, fluffy cloud?

   a. stratus
   b. cirrus
   c. cumulonimbus
   d. cumulus

2. What kind of precipitation is common for a winter storm in Pennsylvania?

   a. sunshine
   b. rain
   c. hurricane
   d. snow

3. What instrument is commonly used to measure wind direction?

   a. thermometer
   b. barometer
   c. wind vane
   d. anemometer

4. Which month would usually be the coldest in Pennsylvania?

   a. July
   b. January
   c. June
   d. September

5. Which temperature is the coldest?

   a. 70°F
   b. 75° F
   c. 30° F
   d. 25° F

6. Which of the following is a low, flat cloud?

    a. stratus
    b. cirrus
    c. cumulonimbus
    d. cumulus

7. Which month would usually be the hottest in Pennsylvania?

    a. February
    b. November
    c. August
    d. March

8. What instrument is commonly used to measure wind speed?

    a. thermometer
    b. barometer
    c. wind vane
    d. anemometer

9. What is precipitation?

    a. windy weather
    b. water that falls from clouds
    c. a cold temperature
    d. a thick cloud near the ground

10. Which of the following wind speeds would be the windiest?

    a. 10 mph
    b. 100 mph
    c. 2 mph
    d. 50 mph

<u>Matching:</u> Draw a line to connect the cloud with its name. You will have one cloud name left over.

11. 

Cirrus Cloud

12. 

Stratus Cloud

Cumulonimbus Cloud

13. 

Cumulus Cloud

<u>Short Answer:</u> Write your answers on the lines provided.

14. Which season is cold and snowy?

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15. Which season is hot and humid?

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16. In which season do the leaves change colors?

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17. In which season do flowers bloom?

Pre-Test Answer Key

Multiple Choice: (5 points each)

1. d
2. d
3. c
4. b
5. d
6. a
7. c
8. d
9. b
10. b

Matching (10 points each)

11. Stratus Cloud
12. Cumulous Cloud
13. Cirrus Cloud

Short Answer (5 points each)

14. Winter
15. Summer
16. Fall/Autumn
17. Spring

Pre-Test Usage

This pretest aims to measure students' previous knowledge of the vocabulary and concepts that are either a necessary prerequisite for the weather unit or will be taught during the unit. The teacher should look at both students' overall scores on the test for previous knowledge of the concepts presented in the unit as well as look at individual questions scores to modify their instruction of each element of the unit. Scores on the tests will dictate how much time a teacher must spend teaching (or reviewing) each element of the unit in order to achieve the objectives set for the unit.

Post-Assessment

Name_____ Date _____/_____/_____

Weather Test

<u>Matching:</u> Write the letter of each cloud next to its description. You may use each cloud more than once.

a. Cirrus b. Cumulus

c. Stratus d. Cumulonimbus

_____ 1. This cloud is often the first sign of an approaching warm front.

_____ 2. This is a low, flat cloud that may indicate no precipitation or a light drizzle.

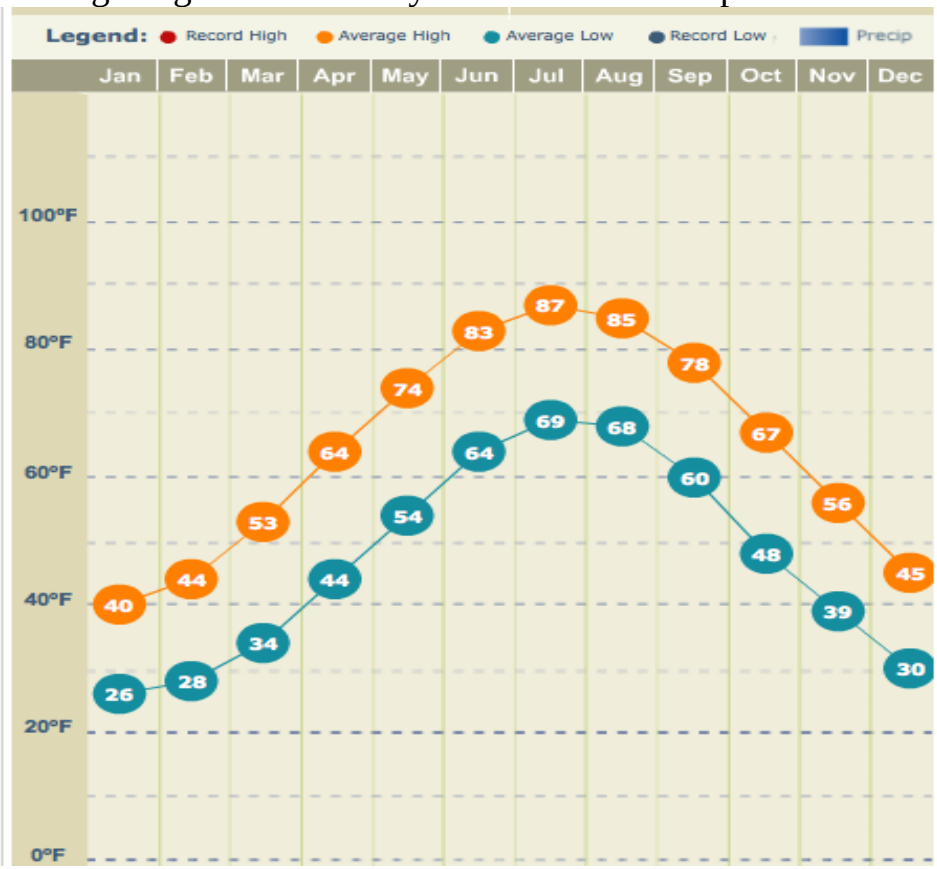
_____ 3. This big, puffy cloud can sometimes mean it will rain, and sometimes mean it will be sunny.

_____ 4. This cloud is found high in the sky and looks feathery and wispy.

_____ 5. This large cloud usually means thunderstorms.

<u>Short Answer (Part 1):</u> For questions 6-7, use the following chart showing average monthly high and low temperatures of Philadelphia. Write your answers on the lines provided.

Average Highs and Lows by Month for Philadelphia



6. Which month had the hottest average temperature in Philadelphia?

_____

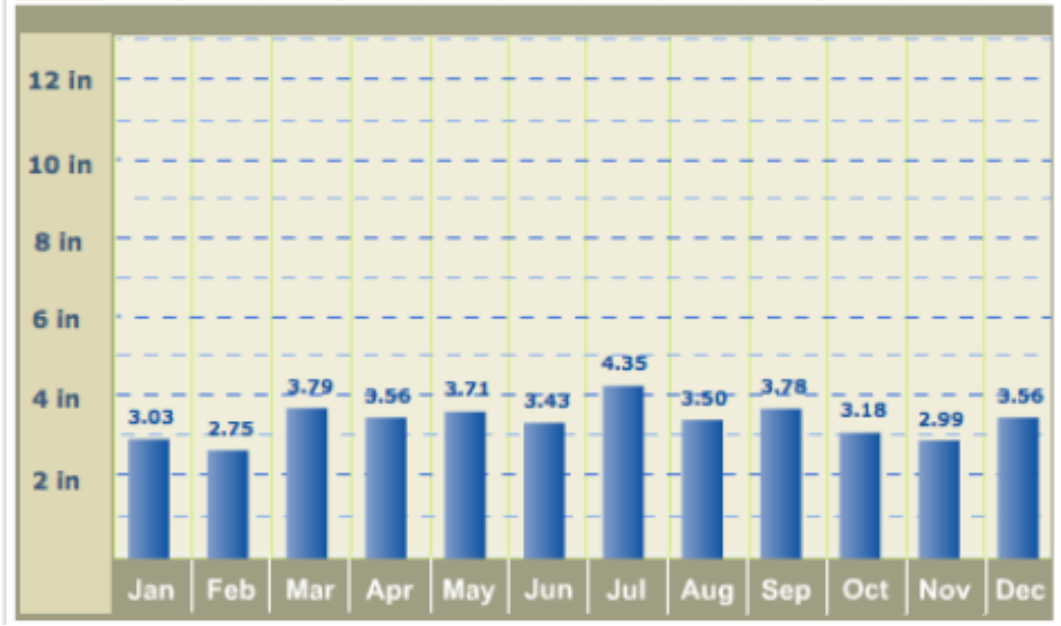
_____

7. Which month had the coldest average temperature in Philadelphia?

_____

<u>Short Answer (Part 2):</u> For questions 8-10, use the following chart showing monthly precipitation in Philadelphia. Write your answers on the lines provided.

Average Rainfall in Philadelphia by Month



8. Which month had an average of 4.35 inches of rainfall in Philadelphia?

9. What was the average precipitation, in inches, during September?

10. On average, which month did Philadelphia get the most rain?

<u>Multiple Choice:</u> For questions 11-15, use the pictures to answer the questions. Assume you are in Pennsylvania. Circle the letter of the best answer.

11. What is the most likely season?

a. Summer
b. Winter
c. Spring
d. Fall

12. During this hurricane, the wind speed was probably…

a. 10 mph
b. 25 mph
c. 500 mph
d. 100 mph

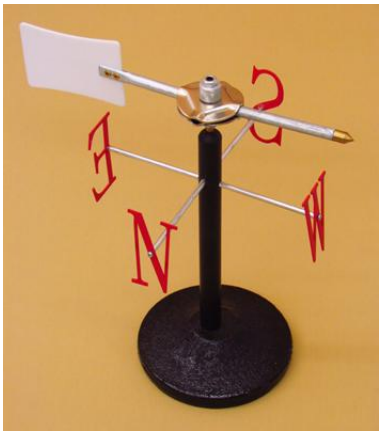
13. Which temperature could it be in the picture?

a. 25° F
b. 75° F
c. 100° F
d. 55° F

14. What is the name of the tool below?

a. barometer
b. anemometer
c. wind vane
d. rain gauge

15. What is the name of the tool below?



a. barometer
b. anemometer
c. wind vane
d. rain gauge

<u>True/False:</u> Read the following statements about weather in Pennsylvania. Next to each statement, write T for True or F for False. If the statement is false, fix the statement to make it True.

_____ 16. In Pennsylvania, the <u>summers</u> are hot and humid.

_____ 17. Floods happen most often in <u>spring</u>.

_____ 18. Snow usually occurs in the <u>summer</u>.

_____ 19. In the <u>spring</u>, the leaves change colors and drop off trees.

_____ 20. The coldest temperatures happen in <u>winter</u>.

Weather Test Answer Key

Matching (5 points each)

1. a
2. c
3. b
4. a
5. d

Short Answer (6 points each)

6. July
7. January
8. July
9. 3.78
10. July

Multiple Choice (5 points each)

11. a
12. b
13. d
14. b
15. c

True/False (4 points each) If false, 2 point for answers and 2 point for correction.

16. true
17. true
18. false, Snow usually occurs in the winter.
19. false, In the fall/autumn, leaves change colors and drop off trees.
20. true

Post-Test Logic

This post test aims to measure how well students have met the objectives defined for the unit. Items are weighed similarly by item type; however, different objectives are weighed differently. Objectives were weighted by how necessary they to learn information which builds off the concepts and how important they are in daily life. Additionally, items that are also examined in the performance assessment were assigned les weight due to dual assessment.

Performance Assessment

Weather Report Script

Use the script below to report today's weather. Use the appropriate tools to fill in the blanks or select a choice below. Make your measurements as specific as possible. Use the example as a guide.

Speaker 1:	Good morning, we are reporting from Lehigh Elementary School. This is _____ (Speaker 1 name) ...
Speaker 2:	…and_____ (Speaker 2 name). Today the temperature is _____*degrees* Fahrenheit.
Speaker 1:	The barometric pressure is _____._____. Winds are coming from the _____ _____
Speaker 2:	at a wind speed of _____ miles per hour.
Speaker 1:	The precipitation is (*choose 1:* rain snow hail sleet) ***or*** There is no precipitation.
Speaker 2:	The rain gauge shows _____ inches of precipitation have fallen.
Speaker 1:	Enjoy this (*choose 1-2:* hot cold windy nice wet) day.
Speaker 2:	Thank you and good bye.

Example

Speaker 1:	Good morning, we are reporting from Lehigh Elementary School. This is Billy Williams ...
Speaker 2:	…and Samantha Smith. Today the temperature is 65 *degrees* Fahrenheit.
Speaker 1:	The barometric pressure is 29.5. Winds are coming from the north west
Speaker 2:	at a wind speed of 16 miles per hour.
Speaker 1:	The precipitation is (*choose 1* (rain) snow hail sleet) ***or*** ~~There is no precipitation.~~
Speaker 2:	The rain gauge shows 2 inches of precipitation have fallen.
Speaker 1:	Enjoy this (*choose 1-2:* hot cold windy nice (wet) day.
Speaker 2:	Thank you and good bye.

Weather Report Performance Assessment

Students will use the provided script to record and report the weather. Students in pairs of two will measure the temperature using a thermometer, the wind speed using an anemometer, the wind direction using a wind vane, the barometric pressure using a barometer and precipitation using observation and a rain gauge. Each measurement will be recorded in their script and the script will be read and recorded with an iPod. The script and recording will be graded using the rubric below.

	Temperature	**Wind Speed**	**Wind Direction**	**Barometric Pressure**	**Precipitation**
5	Temperature is accurate to ± 1° F on both the audio recording and written weather report.	Wind speed is accurate to ± 2 mph on both the audio recording and written weather report.	Wind direction is correct to two directions (e.g. NE, SW) on both the audio recording and written report.	Barometric pressure is accurate to ± 0.1 on both the audio recording and written weather report.	Precipitation type and rain gauge reading are accurate on both the audio recording and written weather report.
4	Temperature is accurate to ± 1° F on either the audio recording or written weather report.	Wind speed is accurate to ± 2 mph on either the audio recording or written weather report.	Wind direction is correct to two directions (e.g. NE, SW) on either the audio recording or written report.	Barometric pressure is accurate to ± 0.1 on either the audio recording or written weather report.	Precipitation type or rain gauge reading is accurate on both the audio recording and written weather report.
3	Temperature is accurate to ± 3° F on both the audio recording and written weather report.	Wind speed is accurate to ± 5 mph on both the audio recording and written weather report.	Wind direction is correct to one direction (e.g. N, S) on both the audio recording and written report.	Barometric pressure is accurate to ± 0.3 on both the audio recording and written weather report.	Precipitation type and rain gauge reading are accurate on either the audio recording or written weather report.
2	Temperature is accurate to ± 3° F on either the audio recording or written weather report.	Wind speed is accurate to ± 5 mph on either the audio recording or written weather report.	Wind direction is correct to one direction (e.g. N, S) on either the audio recording or written report.	Barometric pressure is accurate to ± 0.3 on either the audio recording or written weather report.	Precipitation type or rain gauge reading is accurate on either the audio recording or written weather report.
1	Temperature is ± 4° F or greater from actual on both audio recording and written report.	Wind speed is not accurate to at least ± 5 mph on both the audio recording and written weather report.	Wind direction is incorrect on both the audio recording and written report.	Barometric pressure is ± 0.4 or greater from actual on both audio recording and written report.	Precipitation type and rain gauge reading are inaccurate on both the audio recording and written weather report.

Accommodations for Diverse Learners

Accommodation 1: Student with visual disability (limited vision and difficulty with standard print, visual-perceptual disability)

Accommodations for the student with a visual disability started with administration of both the pre-test and post-test using larger text and pictures. The student was provided with large-print items during unit assignments as well. Directions were bolded with larger spaces included between each question. Furthermore, larger spaces were included between lines where students were required to fill in short answer responses. Copies of these accommodated tests are available in Appendices A and B. Options for a differentiated testing setting in a location with minimal visual distractions and enhanced lighting were also available to the student. All directions were read orally to the student to ensure understanding, and any assistive technology the student was familiar with (i.e., a near-vision stand magnifier) were available for the student to use as needed. As per the student's individualized education plan (IEP), extra time was allotted for the tests up to the standard time and a half.

During the performance assessment, the student was paired with a high performing student who could assist the child with measuring and recording the data. Each weather measurement tool was accommodated with larger numerical values on the tool to assist the student visually. Furthermore, the script was printed in large font with large spaces in between each speaker as seen in Appendix C. Directions were bolded and the teacher described the directions in detail to the student to ensure understanding. Any assistive technology the student was familiar with (i.e., a near-vision stand magnifier) was available for the student to use as needed.

Accommodation 2: Student with fine motor skill impairment (unable to record responses using paper and pencil in standard manner):

Accommodations for the student with the fine motor skill impairment started with administration of both the pre-test and the post-test using an amanuensis in an alternate setting. The student was allowed use of the scribe during unit assignments as well. The student was provided with a visual copy of the tests and allowed responded verbally with answers which were recorded by her aid. As per the student's IEP, extra time was allotted for the tests up to the standard time and a half.

During the performance assessment, the student with the fine-motor skill impairment had access to a scribe to record the student's verbal responses in the script section of the performance assessment. Additionally, the student was paired with a high performing student who could assist the child by holding the measurement tools while measuring and recording the data. The paired student was instructed to take the lead on controlling the iPod during the recording phase of the performance assessment, but the student with fine-motor skill impairment was required to report her portion of the script individually.

Appendix A

Name:_____ Date___/____/____

Weather PRE-TEST

<u>Multiple Choice:</u> Please answer each question to the best of your ability. Circle the letter of the best answer.

1. Which of the following is a low, fluffy cloud?

   a. stratus

   b. cirrus

   c. cumulonimbus

   d. cumulus

2. What kind of precipitation is common for a winter storm in Pennsylvania?

   a. sunshine

   b. rain

   c. hurricane

   d. snow

3. What instrument is commonly used to measure wind direction?

   a. thermometer

   b. barometer

   c. wind vane

   d. anemometer

4. Which month would usually be the coldest in Pennsylvania?

   a. July

   b. January

   c. June

   d. September

5. Which temperature is the coldest?

   a. 70°F

   b. 75° F

   c. 30° F

   d. 25° F

6. Which of the following is a low, flat cloud?

a. stratus
b. cirrus
c. cumulonimbus
d. cumulus

7. Which month would usually be the hottest in Pennsylvania?

a. February
b. November
c. August
d. March

8. What instrument is commonly used to measure wind speed?

a. thermometer
b. barometer
c. wind vane
d. anemometer

9. What is precipitation?

a. windy weather

b. water that falls from clouds

c. a cold temperature

d. a thick cloud near the ground

10. Which of the following wind speeds would be the windiest?

a. 10 mph

b. 100 mph

c. 2 mph

d. 50 mph

<u>Matching:</u> Draw a line to connect the cloud with its name. You will have one cloud name left over.

11. 

Cirrus Cloud

12. **Stratus Cloud**

Cumulonimbus Cloud

13. **Cumulus Cloud**

<u>Short Answer:</u> Write your answers on the lines provided.

18. Which season is cold and snowy?

---

19. Which season is hot and humid?

---

20. In which season do the leaves change colors?

---

21. In which season do flowers bloom?

Appendix B

NAME_____

Date _____/_____/_____

Weather Test

<u>Matching:</u> Write the letter of each cloud next to its description. You may use clouds more than once.

a. cirrus b. cumulus

c. stratus d. cumulonimbus

_____ 1. This cloud is often the first sign of an approaching warm front.

_____ 2. This is a low, flat cloud that may indicate no precipitation or a light drizzle.

_____ 3. This big, puffy cloud can sometimes mean it will rain, and sometimes mean it will be sunny.

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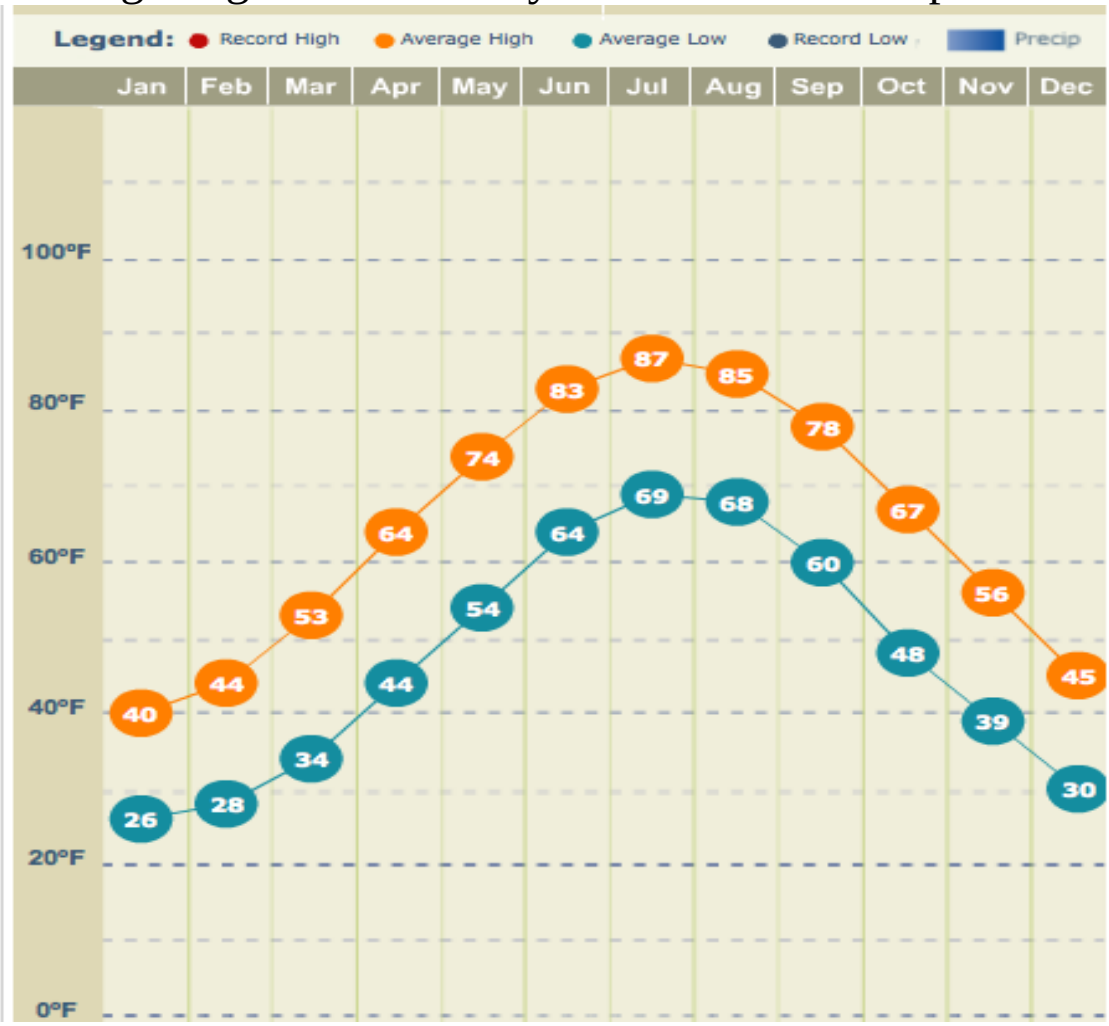

6. Which month had the hottest average temperature in Philadelphia?

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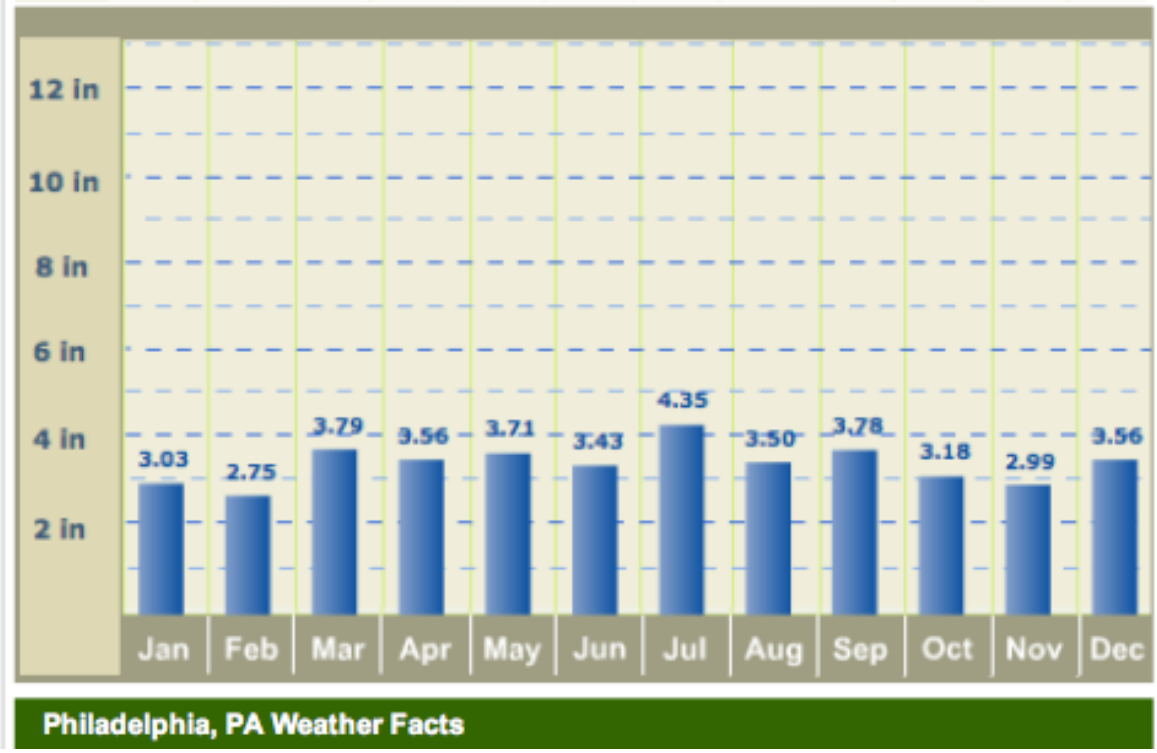
7. Which month had the coldest average temperature in Philadelphia?

<u>Short Answer (Part 2):</u> For questions 8-10, use the following chart showing monthly precipitation in Philadelphia. Write your answers on the lines provided.

Average Rainfall in Philadelphia by Month



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9. What was the average precipitation, in inches, during September?

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10. On average, which month did Philadelphia get the most rain?

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11. What is the most likely season?

e. Summer

f. Winter

g. Spring

h. Fall

12. During this hurricane, the wind speed was probably…

a. 10 mph

b. 25 mph

c. 500 mph

d. 100 mph

13. Which temperature could it be in the picture?

a. 25° F

b. 75° F

c. 100° F

d. 55° F

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a. barometer

b. anemometer

c. wind vane

d. rain gauge

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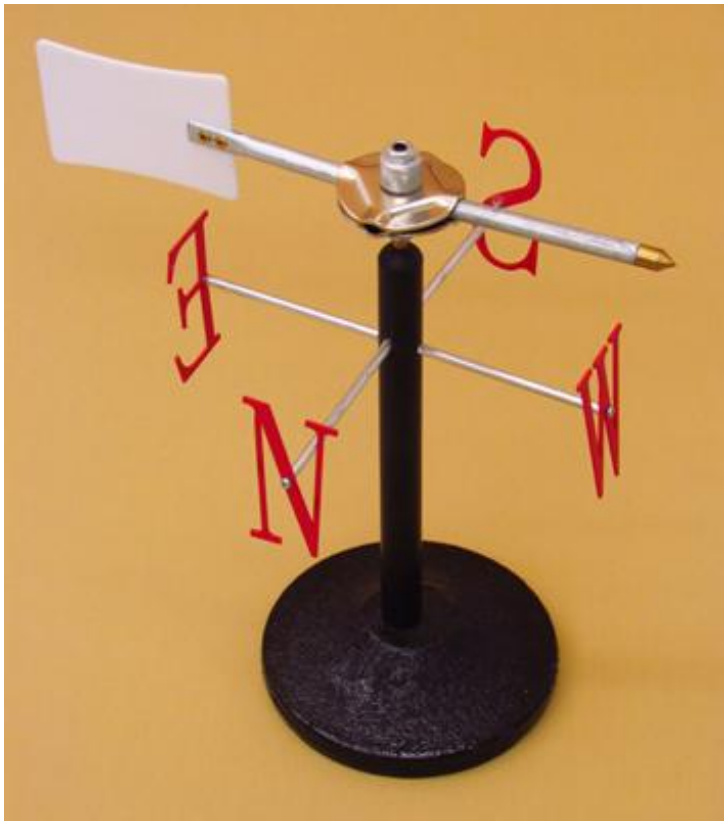

a. barometer

b. anemometer

c. wind vane

d. rain gauge

<u>True/False:</u> Read the following statements about weather in Pennsylvania. Next to each statement, write T for True or F for False. If the statement is false, fix the statement to make it True.

_____ 16. In Pennsylvania, the **<u>summers</u>** are hot and humid.

_____ 17. Floods happen most often in **<u>spring</u>**.

_____ 18. Snow usually occurs in the **<u>summer</u>**.

_____ 19. In the **<u>spring</u>**, the leaves change colors and drop off trees.

_____ 20. The coldest temperatures happen in **<u>winter</u>**.

Appendix C

Weather Report Script

Use the script on the next page to report today's weather. Use the appropriate tools to fill in the blanks or select a choice. Make your measurements as specific as possible. Use the example below as a guide.

Example

Speaker 1:	Good morning, we are reporting from Lehigh Elementary School. This is Billy Williams ...
Speaker 2:	…and Samantha Smith. Today the temperature is 65 *degrees* Fahrenheit.
Speaker 1:	The barometric pressure is 29.5. Winds are coming from the north west
Speaker 2:	at a wind speed of 16 miles per hour.
Speaker 1:	The precipitation is (*choose 1:* ~~rain~~ snow hail sleet) ***or*** ~~There is no precipitation.~~
Speaker 2:	The rain gauge shows 2 inches of precipitation have fallen.
Speaker 1:	Enjoy this (*choose 1-2:* hot cold windy nice ~~wet~~) day.
Speaker 2:	Thank you and good bye.

Speaker 1:	Good morning, we are reporting from Lehigh Elementary School. This is _____ (Speaker 1 name) ...
Speaker 2:	…and_____(Speaker 2 name). Today the temperature is _____*degrees* Fahrenheit.
Speaker 1:	The barometric pressure is _____._____. Winds are coming from the _____ _____
Speaker 2:	at a wind speed of _____ miles per hour.
Speaker 1:	The precipitation is (*choose 1:* rain snow hail sleet) ***or*** There is no precipitation.
Speaker 2:	The rain gauge shows _____ inches of precipitation have fallen.
Speaker 1:	Enjoy this (*choose 1-2:* hot cold windy nice wet) day.
Speaker 2:	Thank you and good bye.