Geography Standard: Understands how physical systems affect human systems

Benchmark: Knows the ways in which human activities are constrained by the physical environment

El Niño Brings Weird Weather

Did you know that a change in the water temperature near South America can affect your weather? It's true. An ocean current runs along the shore of Peru. It normally flows from south to north. Each year in late December it changes direction and flows north to south. When that happens, warmer waters flow along the coast. Sometimes when this happens, the water gets too warm for the fish. They must leave the area to find food. This causes problems for the people in Peru who rely on the fish for food. Without the fish, many seabirds starve. Their bodies fall into the ocean and rot. This makes a chemical called hydrogen sulfide. This chemical combines with the salt in the water to form an acid so strong that it removes the paint on boats. The wind carries this acid through the air and ruins the paint of the houses on shore, too. It also damages crops and other plants. The people of Peru call this event El Niño, Spanish for "little child."

During the 1800s, scientists studied the personal journals of people who lived in Peru hundreds of years ago. They wrote about these **mysterious** events. Their diaries helped scientists to figure out some of their questions about this strange change in the ocean. In the early 1900s Sir Gilbert Walker wanted to predict dangerous monsoons. Monsoons are strong storms that bring wet, warm weather to India each year. Walker did research and found that El Niño caused the weather to change in India. But no one believed him.

It took another 50 years for scientists to really understand that a strong El Niño current near Peru meant weak monsoons on the other side of the world in India. A weak El Niño current meant strong monsoons. In the years when El Niño is especially strong or the current lasts a long time, it can cause weird weather all around the world. This happens because the current changes the location of the warmest ocean waters. Powerful thunderstorms develop over the warmest water. These storms determine where the winds blow. El Niño can cause areas that usually have little rain to get lots of it. Places that need rain for crops may have a bad dry spell.

Most scientists think that a strong El Niño comes every three to seven years. So far no one can really predict which years the current will have the most effect. When the El Niño current is strong, its effects can last up to a year. During the past 40 years the people who study weather have recorded 10 strong El Niños.

El Niño Brings Weird Weather

Comprehension Questions

1. **Strong El Niños usually occur**
   - (a) once a decade.
   - (b) every year.
   - (c) once a century.
   - (d) every 3–7 years.

2. **During a year with a strong El Niño, what would happen second?**
   - (a) Dead birds fall into the ocean.
   - (b) Many fish leave the area.
   - (c) The current changes direction.
   - (d) Hydrogen sulfide and salt water make a strong acid.

3. **A weak El Niño causes**
   - (a) more rain to fall in India.
   - (b) less rain to fall in India.
   - (c) forest fires in the U.S. Midwest.
   - (d) floods in the African deserts.

4. ***Mysterious*** **means**
   - (a) dangerous.
   - (b) exciting.
   - (c) not understood.
   - (d) predictable.

5. **What do you think most Peruvian fishermen do during strong El Niño seasons?**
   - (a) They have a celebration.
   - (b) They starve to death.
   - (c) They stop fishing and start farming.
   - (d) They go farther away from home to catch fish.

6. **Picture a monsoon approaching the coast of India. What don't you see?**
   - (a) pleasure boats
   - (b) flooding
   - (c) heavy rainfall
   - (d) lightning

7. **What is your favorite type of weather? Explain.**

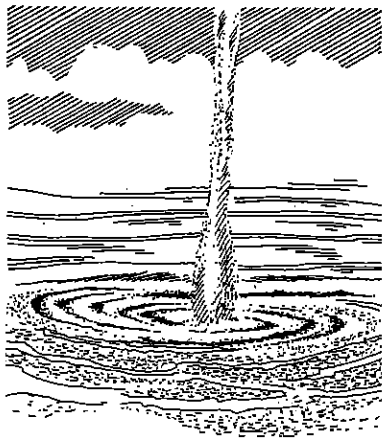
Science Standard: Understands basic features of Earth
Benchmark: Knows ways in which clouds affect weather and climate

Wild Weather

You've probably heard the saying, "It's raining cats and dogs!" That's just an expression to say that it's raining hard. But would you believe that one day in France it really rained frogs?

It started out just a typical rainy day in a small town near Paris. People went out with raincoats and umbrellas. Everything seemed normal. Suddenly, frogs started falling from the sky. They smashed through car windows. They bounced off people's heads. Everyone was scared. What was happening?

Scientists believe a waterspout made the frogs fall. Waterspouts are like tornadoes that form over large lakes or oceans. A waterspout forms when warm, moist air meets cold, dry air and creates a thick, spinning cloud. This cloud has wind speeds of about 50 miles per hour (80 kph). It can reach up to four miles (6.4 km) high in the atmosphere. Just like a land tornado, a waterspout lifts things up and swirls them around, sometimes dropping them far away. A waterspout lasts longer than a tornado, but it loses power as it moves over land. As its strength **diminishes**, the things it sucked up from the water drop to the ground—sometimes up to 100 miles (160 k) away from where they were collected.



Most waterspouts occur in the tropics, but America has had its share of them. Snails fell in Pennsylvania in 1869. Seven years later, hundreds of large snakes fell in Tennessee. In Louisiana thousands of fish plunged to the ground in 1949. In more recent years a waterspout picked up a five-ton (4.5 metric tons) houseboat and flung it on the ground in Florida.

Wild Weather

Comprehension Questions

1. **Snakes fell from the sky in**
   - (a) Louisiana.
   - (b) Pennsylvania.
   - (c) Tennessee.
   - (d) Florida.

2. **In the formation of a waterspout, what would happen third?**
   - (a) Water animals are snatched up out of the water.
   - (b) Warm air and cold air meet over water.
   - (c) A spinning funnel cloud forms.
   - (d) Animals fall from the sky.

3. **How do tornadoes and waterspouts differ?**
   - (a) The winds in waterspouts spin faster than those in tornadoes.
   - (b) Waterspouts can't move over land; tornadoes can.
   - (c) Tornadoes cause less damage than waterspouts.
   - (d) Tornadoes don't form over water; waterspouts do.

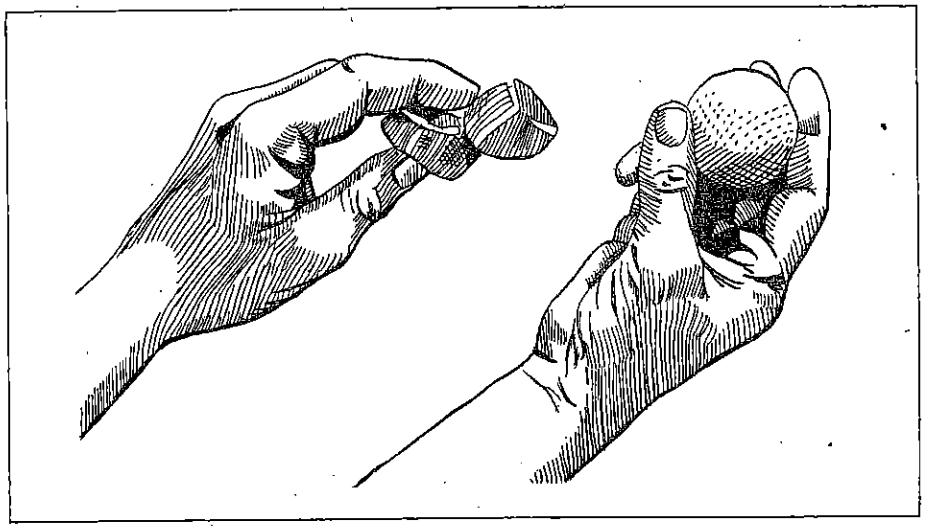
4. **The opposite of *diminishes* is**
   - (a) changes.
   - (b) fades.
   - (c) increases.
   - (d) decreases.

5. **Even with modern weather forecasting,**
   - (a) no one can predict when a waterspout will occur.
   - (b) no one has ever seen a waterspout.
   - (c) no one knows how waterspouts form.
   - (d) no one knows when a waterspout has happened.

6. **Picture a waterspout over the ocean. What is it most likely to suck up?**
   - (a) frogs
   - (b) fish
   - (c) snails
   - (d) snakes

7. **Would you like to experience a waterspout? Explain.**

The Ice of Summer



A hailstorm can be a terrible sight to see. So many hailstones may fall that the ground becomes as white as snow. As they fall, hailstones may break windows and flatten plants. They may even kill animals. They sound like thunder as they beat on the roofs of houses. Hailstones are balls of ice. But since hailstorms happen in the summer, where does the ice come from?

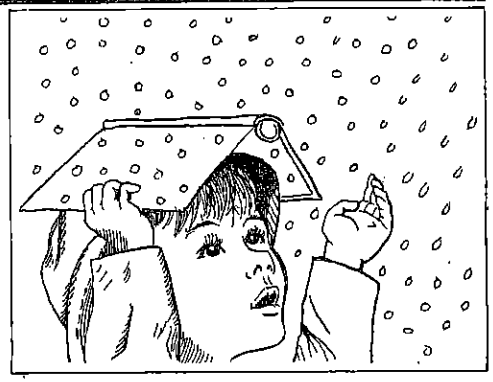
A hailstorm starts out as a rainstorm, and a hailstone starts out as a raindrop. Sometimes in the summer there is a layer of cold air just above the earth. When a raindrop falls through this cold air, it freezes. Before it can reach the ground, wind carries it up into warm air again. In the warm air, more raindrops stick to the frozen raindrop. When the frozen raindrop falls into the cold air again, the raindrops sticking to it freeze too. Now the frozen raindrop is bigger. If the wind carries the raindrop up again, it may collect more water in the warm air. Then it falls back into the cold air and freezes again. The raindrop may bounce back and forth between the warm air and the cold air many times. Each time it bounces, it gets bigger. Finally it is a ball of ice called a hailstone. When it is heavy enough, the hailstone falls to the ground. Some hailstones can weigh as much as a pound, and they do great damage. But most hailstones are much smaller and less harmful, although they can ruin your garden.

Hailstorms, with their winds and lightning, are exciting. But they can be dangerous too. So it's good that hailstorms only happen once in a while.

Think About It
Write about a time when you were in bed and there was a terrible storm going on outside. How did you feel? What did you do?

Name _____

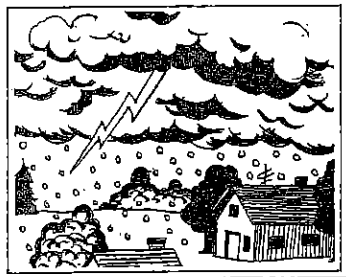
The Ice of Summer



Main Idea
1. This story explains
_____ rainstorms.
_____ thunder and lightning.
_____ hailstorms.

Sequencing
2. Number the events below in the order that they happen.
_____ The hailstone becomes heavy and falls to the ground.
_____ When more raindrops freeze on the frozen raindrop, it gets bigger.
_____ A raindrop falls through cold air and freezes.
_____ Wind carries the frozen raindrop back up to the warm air.

Reading for Details
3. Use the clues to answer these questions.
What are hailstones? (paragraph 1) _____
What does a hailstone start out as? (paragraph 2) _____
Where is the layer of cold air found in the summer? (paragraph 2) _____
_____
When does the raindrop freeze? (paragraph 2) _____
_____
Why can hailstones do great damage? (paragraph 2) _____
_____



Reading for Understanding
4. Write yes or no in the blank.
A hailstorm can be described as

_____ deadly	_____ beautiful
_____ damaging	_____ terrible
_____ scary	_____ exciting
_____ harmful	_____ dangerous

Reading a Decimal in Word Form

Name: _____

What is the word form of each decimal?

Yellow

1. 0.2 _____
2. 0.02 _____
3. 0.002 _____
4. 0.12 _____
5. 0.012 _____
6. 0.102 _____
7. 1.002 _____
8. 9.4 _____
9. 90.04 _____
10. 0.94 _____
11. 500.2 _____
12. 8.008 _____
13. 700.06 _____
14. 6.335 _____
15. 3,000.001 _____

16. What strategies did you use to help you read the decimals? Explain.

Fluency and Skills Practice

Reading a Decimal in Word Form

Name: _____

What is the word form of each decimal?

1. 0.2 _____
2. 0.02 _____
3. 0.002 _____
4. 0.12 _____
5. 0.012 _____
6. 0.102 _____
7. 1.002 _____
8. 9.4 _____
9. 90.04 _____
10. 0.94 _____
11. 500.2 _____
12. 8.008 _____
13. 700.06 _____
14. 6.335 _____
15. 3,000.001 _____

16. What strategies did you use to help you read the decimals? Explain.

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Writing a Decimal in Standard Form

Name: _____

green

What decimal represents each number?

1. one and six tenths

   _____

2. eight and eleven hundredths

   _____

3. $6 \times 1 + 5 \times \frac{1}{10}$

   _____

4. thirteen and thirteen thousandths

   _____

5. $2 \times 10 + 7 \times \frac{1}{10} + 3 \times \frac{1}{100}$

   _____

6. $4 \times 1 + 1 \times \frac{1}{100} + 9 \times \frac{1}{1{,}000}$

   _____

7. five hundred twelve thousandths

   _____

8. $8 \times 100 + 2 \times \frac{1}{10} + 8 \times \frac{1}{1{,}000}$

   _____

9. $2 \times 1 + 4 \times \frac{1}{100}$

   _____

10. forty-two and forty-one hundredths

    _____

11. $7 \times 100 + 2 \times 10 + 3 \times 1 + 6 \times \frac{1}{10}$

    _____

12. twelve and sixty-eight thousandths

    _____

13. $3 \times 1{,}000 + 6 \times 100 + 3 \times 10 + 7 \times \frac{1}{10} + 2 \times \frac{1}{100} + 8 \times \frac{1}{1{,}000}$

    _____

14. nine hundred fifty-six and four hundred twenty-seven thousandths

    _____

15. How was writing decimals for numbers in word form different from writing decimals for numbers in expanded form?

Fluency and Skills Practice

Writing a Decimal in Standard Form

Name: _____

What decimal represents each number?

1. one and six tenths
2. eight and eleven hundredths
3. $6 \times 1 + 5 \times \frac{1}{10}$
4. thirteen and thirteen thousandths
5. $2 \times 10 + 7 \times \frac{1}{10} + 3 \times \frac{1}{100}$
6. $4 \times 1 + 1 \times \frac{1}{100} + 9 \times \frac{1}{1{,}000}$
7. five hundred twelve thousandths
8. $8 \times 100 + 2 \times \frac{1}{10} + 8 \times \frac{1}{1{,}000}$
9. $2 \times 1 + 4 \times \frac{1}{100}$
10. forty-two and forty-one hundredths
11. $7 \times 100 + 2 \times 10 + 3 \times 1 + 6 \times \frac{1}{10}$
12. twelve and sixty-eight thousandths
13. $3 \times 1{,}000 + 6 \times 100 + 3 \times 10 + 7 \times \frac{1}{10} + 2 \times \frac{1}{100} + 8 \times \frac{1}{1{,}000}$
14. nine hundred fifty-six and four hundred twenty-seven thousandths
15. How was writing decimals for numbers in word form different from writing decimals for numbers in expanded form?

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Understanding Powers of 10

Name: _____

orange

Multiply or divide.

1. $6 \div 10$ _____
2. $0.6 \div 10$ _____
3. $6 \div 10^2$ _____
4. $0.6 \div 10^2$ _____
5. $6 \div 10^3$ _____
6. $60 \div 10^3$ _____
7. 0.3×10 _____
8. 0.3×10^2 _____
9. 0.3×10^3 _____
10. 0.03×10^2 _____
11. 0.003×10^2 _____
12. 0.03×10^3 _____
13. $72 \div 10$ _____
14. 0.72×10^2 _____
15. $7{,}200 \div 10^3$ _____
16. $20 \div 10^2$ _____
17. 0.9×10^3 _____
18. 0.001×10^2 _____
19. $54 \div 10$ _____
20. $150 \div 10^3$ _____
21. 0.46×10^3 _____

22. What strategies did you use to solve the problems? Explain.

Fluency and Skills Practice

Understanding Powers of 10

Name: _____

Multiply or divide.

1. $6 \div 10$ _____
2. $0.6 \div 10$ _____
3. $6 \div 10^2$ _____
4. $0.6 \div 10^2$ _____
5. $6 \div 10^3$ _____
6. $60 \div 10^3$ _____
7. 0.3×10 _____
8. 0.3×10^2 _____
9. 0.3×10^3 _____
10. 0.03×10^2 _____
11. 0.003×10^2 _____
12. 0.03×10^3 _____
13. $72 \div 10$ _____
14. 0.72×10^2 _____
15. $7{,}200 \div 10^3$ _____
16. $20 \div 10^2$ _____
17. 0.9×10^3 _____
18. 0.001×10^2 _____
19. $54 \div 10$ _____
20. $150 \div 10^3$ _____
21. 0.46×10^3 _____

22. What strategies did you use to solve the problems? Explain.

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Comparing Decimals

Write the symbol <, =, or > in each comparison statement.

purple

1. 0.02 ◯ 0.002
2. 0.05 ◯ 0.5
3. 0.74 ◯ 0.84
4. 0.74 ◯ 0.084
5. 1.2 ◯ 1.25
6. 5.130 ◯ 5.13
7. 3.201 ◯ 3.099
8. 0.159 ◯ 1.590
9. 8.269 ◯ 8.268
10. 4.60 ◯ 4.060
11. 302.026 ◯ 300.226
12. 0.237 ◯ 0.223
13. 3.033 ◯ 3.303
14. 9.074 ◯ 9.47
15. 6.129 ◯ 6.19
16. 567.45 ◯ 564.75
17. 78.967 ◯ 78.957
18. 5.346 ◯ 5.4
19. 12.112 ◯ 12.121
20. 26.2 ◯ 26.200
21. 100.32 ◯ 100.232

22. What strategies did you use to solve the problems? Explain.

Fluency and Skills Practice

Comparing Decimals

Write the symbol <, =, or > in each comparison statement.

1. 0.02 ◯ 0.002
2. 0.05 ◯ 0.5
3. 0.74 ◯ 0.84
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17. 78.967 ◯ 78.957
18. 5.346 ◯ 5.4
19. 12.112 ◯ 12.121
20. 26.2 ◯ 26.200
21. 100.32 ◯ 100.232

22. What strategies did you use to solve the problems? Explain.

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Rounding Decimals

Name: _____

blue

Round each decimal to the nearest tenth.

1. 0.32 _____
2. 3.87 _____
3. 0.709 _____
4. 12.75 _____
5. 12.745 _____
6. 645.059 _____

Round each decimal to the nearest hundredth.

7. 1.079 _____
8. 0.854 _____
9. 0.709 _____
10. 12.745 _____
11. 645.059 _____
12. 50.501 _____

Round each decimal to the nearest whole number.

13. 1.47 _____
14. 12.5 _____
15. 200.051 _____

16. Write two different decimals that are the same value when rounded to the nearest tenth. Explain why the rounded values are the same.

17. Round 1.299 to the nearest tenth and to the nearest hundredth. Explain why the rounded values are equivalent.

Fluency and Skills Practice

Name: _____

Round each decimal to the nearest tenth.

1. 0.32 _____
2. 3.87 _____
3. 0.709 _____
4. 12.75 _____
5. 12.745 _____
6. 645.059 _____

Round each decimal to the nearest hundredth.

7. 1.079 _____
8. 0.854 _____
9. 0.709 _____
10. 12.745 _____
11. 645.059 _____
12. 50.501 _____

Round each decimal to the nearest whole number.

13. 1.47 _____
14. 12.5 _____
15. 200.051 _____

16. Write two different decimals that are the same value when rounded to the nearest tenth. Explain why the rounded values are the same.

17. Round 1.299 to the nearest tenth and to the nearest hundredth. Explain why the rounded values are equivalent.

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