

When the Sun Stands Still

Grades 3-5

English Language Arts, Math, Science



Objectives

Students will discover the history of evergreen trees in celebrations of the Winter Solstice and how those traditions carry over into present-day observations. Students will engage in hands-on activities that illustrate how the earth's tilt on its axis creates not only the shortest day but the seasons.

Vocabulary

pagan—worship of many gods, goddesses, the earth or nature

solstice—one of the two times per year when the sun is the farthest north or south of the equator

Background

Before people had an understanding of the relationship between the earth and the sun, celebrations of the Winter **Solstice** acknowledged the return of the sun. December 21st is typically has the shortest day and the longest night in the Northern Hemisphere. Each year people feared that the sun would continue to sink lower in the sky and eventually disappear.

Even after science proved the earth rotates around the sun in an annual orbit and that the sun would not fall from the sky, **pagan** winter celebrations continued. The Winter Solstice is observed in a variety of ways all over the world. Many of these observations are related to agriculture and the annual rebirth of the sun.

- *Saturnalia* originated in Rome. The celebration was dedicated to Saturn, the god of agriculture and time. Several Christmas and Hanukkah traditions can be traced to this celebration
- Scandinavia's *St. Lucia's Day* combines Norse solstice traditions of lighting fires to scare away spirits with honoring St. Lucia as a symbol of light for Christians.
- *Yule* celebrates the return of the sun and the rebirth of fertile land in Scandinavia, Germany and the British Isles. Yule logs were burned for 12 days to encourage the sun to return. The ashes were used as fertilizer.
- The Chinese celebration of *Dong Zhi* began as a harvest festival and welcomes the return of longer days. While no longer a "government" holiday, many families still gather to celebrate.
- On the longest night of the year, Iranians celebrate the victory of Mirtha, the sun god, over darkness in the festival of *Shab-e Yalda*. Families make wishes and enjoy festive foods.
- For Zuni people of western New Mexico, the winter solstice represents the beginning of a new year. It is marked with a ceremonial dance called *Shalako* and celebrates the rebirth of the sun.
- In the Hopi celebration of *Soyal*, an all night ceremony begins at sunset on the winter solstice. The Hopi sun chief's observations of the sun also governed the planting of crops.
- In Japan, the winter solstice observation of *Toji* is a sacred time for farmers to encourage the return of the sun that will nurture their crops.
- The *Inti Raymi* honors Inti, the sun god in Peru. The Incas fasted for three days before the solstice and then at sunrise on the fourth day they offered chicha (a sacred beer) and sacrificed animals. After the Spanish conquered Peru, the celebration was banned. Because Peru is in the Southern Hemisphere, the Winter Solstice is celebrated in June.

When the Sun Stands Still (continued)

Winter Solstice celebrations differ around the world, but almost all variations have agricultural roots. Before ancient people had understanding of why seasons changed, they knew there was a relatively small window to plant and harvest crops. For most livestock, the breeding season was determined by the changes in climate as well.

Over time, religious celebrations replaced or assimilated many pagan holidays associated with the the winter/summer solstice and the spring/fall equinox. Many cultures that depend on agriculture still observe the “return of the sun” in some way.

Many of today’s holiday traditions have their roots in these early celebrations. For example:

- The pagan Yule celebration is 12 days long.
- The “12 Days of Christmas” song is unrelated to Yule, but the events span 12 days.
- Elf on the Shelf includes 12 days of Christmas activities.
- Yule activities began on the Winter Solstice and ended 12 days later on New Year’s Day with a big, loud party. Our present day New Year’s Eve celebrations are very similar.
- Exchanging gifts can be traced to Saturnalia.
- Lighting candles during Hanukkah has its roots in Winter Solstice celebrations.
- Holiday feasts are consistent with most Winter Solstice celebrations.
- Evergreen trees and wreaths were associated with protection and prosperity during Winter Solstice celebrations.
- Kissing under mistletoe can be traced to Greek, Roman, Druid and Norse celebrations.

Additional Reading

Branley, Franklin M., *Sunshine Makes the Seasons*, Collins, 2005.

Cooper, Susan and Carson Ellis, *The Shortest Day*, Candlewick, 2019

Edwards, Carolyn McVickar, *The Return of the Light: Twelve Tales from Around the World for the Winter Solstice*, DaCapo Press, 2005

McKneally, Ranida, and Grace Lin, *Our Seasons*, Charlesbridge, 2007.

Pfeffer, Wendy, *The Shortest Day: Celebrating the Winter Solstice*, Puffin Books, 2014

Websites

<https://www.history.com/news/8-winter-solstice-celebrations-around-the-world>

<https://kids.nationalgeographic.com/history/article/winter-solstice>

When the Sun Stands Still

Activity 1: Winter Holidays, (English Language Arts) 1 50 minute class period

Students will compare current winter holidays to Winter Solstice celebrations. They will identify the components (like feasting and gift giving) that originated in pagan celebrations.

Oklahoma Academic Standards

Activity 1: Winter Holidays (English Language Arts)

- | | |
|---------|--|
| 3.2.R.4 | Students will summarize facts and details from an informational text. |
| 4.2.R.4 | |
| 5.2.R.4 | |
| 3.3.R.5 | Students will answer inferential questions, using a text to support answers. |
| 4.3.R.5 | Students will answer inferential questions using evidence from one or more texts to support answers. |
| 5.3.R.5 | Students will analyze ideas in one or more texts, providing textual evidence to support their inferences. |
| 3.4.R.5 | Students will acquire new grade-level vocabulary, relate new words to prior knowledge, and apply vocabulary in various contexts. |
| 4.4.R.5 | |
| 5.4.R.5 | |

Materials:

- Activity 1 Worksheet 1 “**Frayer Model**”
- Activity 1 Reading Page 1 “**Celebrations of Light**”
- Activity 1 Worksheet 2 “**Main Idea Outline**”

Procedures

1. Discuss the background information about the Winter Solstice. Discuss some holiday traditions that began as part of Winter Solstice celebrations.
2. Go over vocabulary words. Have students complete Activity 1 Worksheet 1 “**Frayer Model**” for each word.
3. Have students read Activity 1 Reading Page 1 “**Celebrations of Light**”.
Use one of the following activities check comprehension:
4. Lead a discussion that includes the following questions:
 - Why do you think ancient people were afraid when days got shorter?
 - How were ancient celebrations similar to each other?
 - How were ancient celebrations different from each other?
 - How are today’s winter holidays similar to Winter Solstice celebrations?
 - What do we know today that lets us look at shorter days without being afraid?
5. Use Activity 1 Worksheet 2 “**Main Idea Outline**” to summarize important facts and ideas from the reading. Have students include their main idea and supporting details in an essay about winter holidays of yesterday and today.

When the Sun Stands Still

Activity 1 Worksheet 1: Frayer Model



Name: _____ Date: _____

<u>Definition</u>	<u>Facts or Characteristics</u>
<u>Examples</u>	<u>Non-examples</u>

Name: _____ Date: _____

Winter was scary for ancient people. Days got shorter. Crops did not grow. Trees lost their leaves. It was hard to stay warm. Food was hard to find. Lakes and rivers froze. People were afraid the sun would fall from the sky.



The sun is important for life.

Some people believed the sun was a god. Shorter days meant the sun was sick or angry. Science gradually proved these beliefs were false.

By December 25, people knew days were getting longer. Many cultures observed the return of the sun. Celebrations lasted almost two weeks. People used fire to honor the the sun. There were feasts. People ate special foods and gave gifts.

Christmas and Hanukkah evolved from Winter Solstice celebrations in Europe. People honored the Roman god of agriculture and the Persian god of light on December 25th. Over time these celebrations were blended with religious holidays. Church officials in Rome chose December 25 to celebrate the birth of Christ. Hanukkah lasts eight nights. A candle is lit each night. The dates are based on the Hebrew calendar.

Settlers from Europe brought these traditions to North America. Christmas trees and wreaths came from German and Scandinavian Yule celebrations. Greeks, Romans, Druids and Scandinavians kissed under mistletoe. Romans exchanged gifts.



Winter Solstice traditions are different around the world.

Almost all of these have two things in common:

- rebirth of the sun
- agriculture and nature

Ancient people did not know why seasons change. They did know crops need rain, sunlight and warm weather to grow. Food had to be harvested and stored for winter. Winter Solstice feasts celebrated the harvest and honored the sun.

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Activity 1 Worksheet 2: Main Idea Outline



Name: _____ Date: _____

**In your own words, summarize the reading page.
Include the main idea and at least three supporting details that are facts.
Once you identify these, rewrite them in paragraph form on another paper.**

MAIN IDEA

SUPPORTING
DETAIL

SUPPORTING
DETAIL

SUPPORTING
DETAIL

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Activity 2: Winter Solstice, (Math, Science)

1 50 minute class period

Students will participate in hands-on activities to simulate the Winter Solstice and seasons. They will measure the angle of the earth's tilt and determine how a change in tilt might impact climate.

Oklahoma Academic Standards

Activity 2: Winter Solstice (Math, Science)

- 3.GM.1.1 Sort three-dimensional shapes based on attributes.
- 4.GM.2.1 Measure angles in geometric figures and real-world objects with a protractor or angle ruler.
- 5.GM.3.1 Measure and compare angles according to size.
- 5.ESS1.2 Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, in addition to different positions of the sun, moon, and stars at different times of the day, month, and year.

Materials:

- Activity 2 Reading Page 1 “**Science of the Winter Solstice**”
- World Globe
- Large flashlight
- A sphere (ball) and a cube (block) of similar size
- Activity 2 Activity Page 1 “**Earth Model**”
- Activity 2 Worksheet 1 “**The Angle Matters**”
- Wire brad

Procedures

1. Winter holidays like Christmas and Hanukkah evolved from Winter Solstice Celebrations. The term solstice comes from the Latin word *solstitium* which means sun-standing. Have students complete Activity 2 Reading Page 1 “**Science of the Winter Solstice**”.
2. Use the following activity to further illustrate the summer and winter solstice along with the changing seasons
 - Select one student to be the sun. Give the student a large flashlight. Tell the student their job is to point the flashlight at the equator as the globe moves around the sun.
 - Have the remaining students stand around the “sun” in an oval shape (to represent Earth’s elliptical orbit).
 - Choose one wall of the classroom to represent the North Star. Tell students to be sure the north pole always points toward that wall as they pass it around the oval.
 - Turn out or dim classroom lights so the light and dark areas will be more visible.
 - Hand the globe to one student and have students pass the globe in a counter-clockwise direction with the north pole always pointed toward the “north star”.
 - The “sun” will turn in place so the flashlight can follow the globe as it moves.
 - After one complete orbit, have students pass the globe again. Stop the globe at the summer and winter solstice and the spring and fall equinox.
3. Have students research how the position of the earth in relation to the sun creates our seasons and create individual or group presentations.

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Continued procedures:

4. People once believed the earth was flat. Use a sphere, a cube and a flashlight or desk lamp to see how the shape of an object impacts how light is dispersed.
 - Use a desk lamp or have one student hold a flashlight to represent the sun.
 - Have another student hold a sphere and stand about five feet away.
 - Shine the light on the center of the sphere. Have the student turn the sphere to simulate the earth rotating on its axis. Students will observe the light and dark areas of the sphere
 - Have the student hold a cube and repeat the process. Notice the difference in the light and dark areas on the cube.
 - Ask students this question: Would life as we know it be possible if the earth was a different shape? Be sure they think about seasons, climate, the ability of the earth to rotate on its axis, etc.
5. Use Activity 2 Activity Page 1 “**Earth Model**” and Activity 2 Worksheet 1 “**The Angle Matters**” to illustrate how the earth’s tilt on its axis impacts light distribution. Have students work in pairs.
 - Note: If possible, use stiff paper like cardstock for the worksheet. It will be easier to rotate the model if a hole is pre-punched in the cardstock.
 - Follow the instructions on the worksheet.
 - After observing how changing the angle of the earth’s tilt on its axis impact light distribution, have students return the model to the 23.4° angle.
 - Have students rotate the worksheet counterclockwise about one inch at a time so the north pole gets farther away from the light.
 - Now gradually rotate the worksheet clockwise so the north pole gets closer to the flashlight.
 - Discuss how changing the angle of tilt on the axis and rotating the worksheet to change the position of the north pole might impact the amount of sunlight in the Northern Hemisphere.

Name: _____ Date: _____

For people in the Northern Hemisphere, winter is a season of cold, dark days.

The winter solstice marks when half of Earth is tilted the farthest away from the sun. It usually happens on December 21 or 22, at the exact same second around the world.

The winter solstice is also the day of the year with the shortest day and the longest night. The good news is that every day after the winter solstice will be just a little longer.

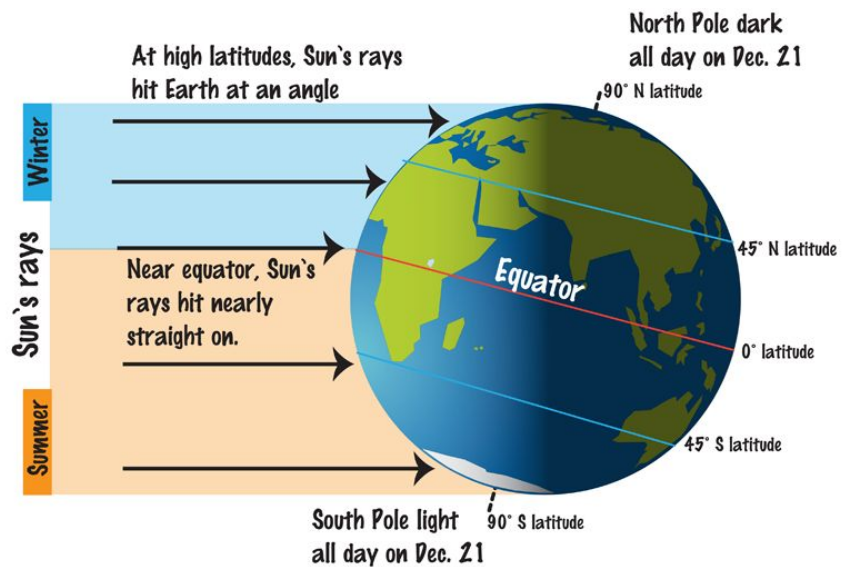
The winter solstice also marks the end of fall and the beginning of winter. In the United States, the winter season lasts about 90 days. It starts during the last days of December and lasts through the middle of March. For most of the Northern Hemisphere, the coldest temperatures will not arrive until January and February. It takes a while for the land and water to cool down. The air temperature drops as soil and water get colder.

Can you see the solstice? Do this experiment. When the sun is shining, stand outside at noon and look at your shadow. Measure your shadow. It will be the longest shadow you cast during the entire year. Do the same experiment in March. Your shadow will be shorter.

As the Earth orbits the sun, one pole is tilted toward the sun, and one pole is tilted away from it. During winter in the Northern Hemisphere, the North Pole is tilted away from the sun, so the sun's arc is low in the sky. That makes your shadow look long.

During the days before and after the winter solstice, the sun is so low on the horizon in the northern U.S. that it appears to rise and set in the same place. That's why the word solstice means "sun stands still" in Latin.

Earth at Winter Solstice (~Dec. 21)



Name: _____ Date: _____

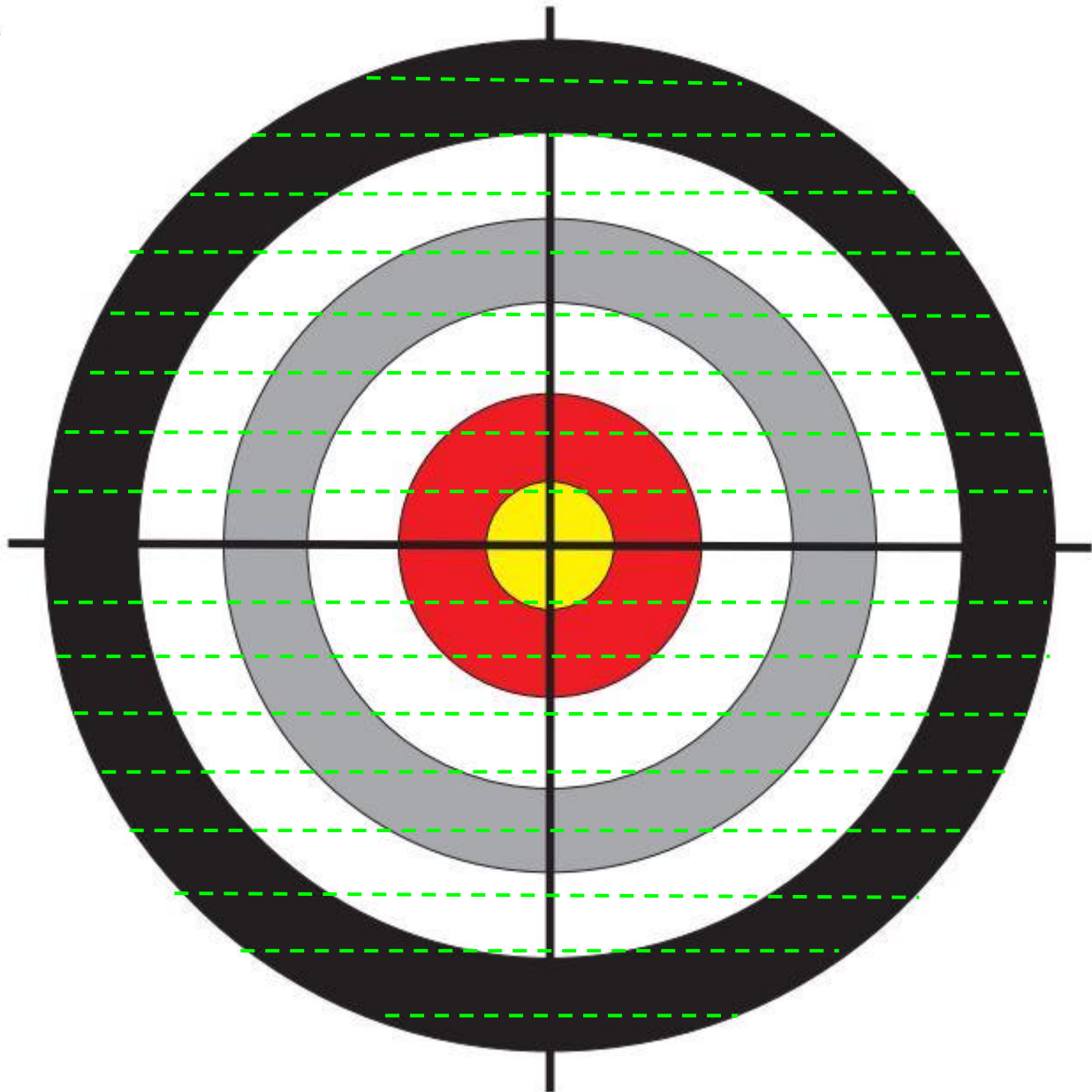
Cut out the bullseye below. Punch a small hole in the center.

The vertical line represents the earth's axis.

The black horizontal line represents the earth's equator.

The green dashed lines represent 10° of latitude.

Oklahoma is located about 35° north of the equator. Mark 35° north on the model.



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Activity 1 Worksheet 1: The Angle Matters



Name: _____ Date: _____

Follow the instructions below to mark a 23.4° angle.

Use a wire brad to fasten the earth model to this page where the lines intersect.

Line up the line axis with the vertical lines.

Shine a flashlight directly on the equator and observe the light distribution.

Rotate the earth model 23.4° to the right and observe the light distribution.

Rotate the model to smaller and larger angles and observe the light distribution.

Discuss how light distribution changes as the earth's tilt on its axis changes.

	<p>← Measure a 23.4° angle from this line</p> <p>Mark the angle and use a pencil and ruler to extend the angle 3 to 4 inches from the point where vertical and horizontal lines intersect.</p>
<p>Place straight edge of protractor on this line</p>	