

**Seasons**  
**Lesson Four**  
**Shadow Lengths on Different Parts of the Earth During the Four**  
**Seasons**

- Standard II: Students will understand how Earth's Tilt on its axis changes the length of daylight and creates the seasons.
- Objective 2: Explain how the relationship between the tilt of Earth's axis and its yearly orbit around the sun produces the seasons.
- Indicator a: Compare Earth's position in relationship to the sun during each season.
- Indicator b: Compare the hours of daylight and illustrate the angle that the sun's rays strike the surface of Earth during summer, fall, winter, and spring in the Northern Hemisphere.
- Supplies: -Globe of the earth  
-“The Shadow Knows” paper  
-Tape  
-Four 1-inch small nails with a head  
-Flashlight

Directions for the globe activity:

1. Tape the nails Salt Lake City, on the Tropic of Cancer, Equator, and the Tropic of Capricorn all in a straight line down.
2. Have the students gather around the globe.
3. As the different seasons are discussed and when the shadows are measured, have the students write the answers on their worksheets.

Spring Position

1. Go to the spring position (flashlight shining on the equator).
2. Turn the globe so that the light is shining on the equator on the nail. Why is there no shadow? Ask the students what does this mean? (It means that there is direct sunlight on the equator during the springtime. When we don't see a shadow, the light is coming at the object directly.)
3. Move the globe where it is morning time according to the light of the flashlight on the globe. Observe the shadow.
4. Move the globe where it is afternoon time according to the light of the flashlight on the globe. There is a shadow at both places also, but they are longer than at noon.
5. What is the big idea here? (When we see a shadow, the light is coming at the object at an angle.)
6. Keeping the light on the nail at the equator look at the nails on the Tropic of Cancer and the Tropic of Capricorn with the nails at noon. Why are there shadows? (They aren't getting direct sunlight at noon like the equator.)
7. Measure the length of the shadows at noon on these two latitude lines.

8. Move the globe where it is morning time. Move the globe where it is afternoon time. What do you see about all three nails? (They all cast shadows.)

#### Summer Position

1. Go to the summer position.
2. Shine a flashlight on the nail that is on the Tropic of Cancer. Turn the globe so that the light is shining right on the nail on the Tropic of Cancer. There is no shadow at noon. Ask the students what does this mean? (It means that there is direct sunlight on the nail. The light is not at an angle.)
3. Move the globe where it is morning time. Move the globe where it is afternoon time. There is a shadow both times except at noon. Why? (The direct sunlight is gone.)
4. What is the big idea here? (When we see a shadow, the light is coming at the object on an angle.)
5. Put the light on the nail on the Tropic of Cancer and look at the nail on Utah with the nails at noon. That means that the nail is pointing directly at the sun. Why is there a shadow? (Earth does not get direct sunlight, even at noon.)
6. Look at the other two nails on the globe. Which one is longer, the equator nail or the Tropic of Capricorn nail? Why? (The angle of light gets smaller down the earth as the light is shining on the earth and makes the shadows longer.)

Fall Position (You could skip this since the questions are the same as the spring.)

1. Go to the fall position (flashlight shining on the equator).
2. Turn the globe so that the light is shining on the equator on the nail. Why is there no shadow? Ask the students what does this mean? (It means that there is direct sunlight on the equator during the springtime. When we don't see a shadow, the light is coming at the object directly.)
3. Move the globe where it is morning time according to the light of the flashlight on the globe. Observe the shadow.
4. Move the globe where it is afternoon time according to the light of the flashlight on the globe. There is a shadow at both places also, but they are longer than at noon.
5. What is the big idea here? (When we see a shadow, the light is coming at the object at an angle.)
6. Keeping the light on the nail at the equator look at the nails on the Tropic of Cancer and the Tropic of Capricorn with the nails at noon. Why are there shadows? (They aren't getting direct sunlight at noon like the equator.)
7. Measure the length of the shadows at noon on these two latitude lines.
8. Move the globe where it is morning time. Move the globe where it is afternoon time. What do you see about all three nails? (They all cast shadows.)

#### Winter Position

1. Go to the winter position.
2. Shine a flashlight on the nail that is on the Tropic of Capricorn. Turn the globe so that the light is shining right on the nail on the Tropic of Capricorn.

- There is no shadow at noon. Ask the students what does this mean? (It means that there is direct sunlight on the nail. The light is not at an angle.)
3. Move the globe where it is morning time. Move the globe where it is afternoon time. There is a shadow both times except at noon. Why? (The direct sunlight is gone.)
  4. What is the big idea here? (When we see a shadow, the light is coming at the object on an angle.)
  5. Put the light on the nail on the Tropic of Capricorn and look at the nail on Utah with the nails at noon. That means that the nail is pointing directly at the sun. Why is there a shadow? (Earth does not get direct sunlight, even at noon.)
  6. Look at the other two nails on the globe. Which one is longer, the equator nail or the Tropic of Capricorn nail? Why? (The angle of light gets smaller down the earth as the light is shining on the earth and makes the shadows longer.)
  7. What do you notice about the shadow of the nail on Utah from spring to summer to fall to winter? (The shadow gets smaller from spring to summer. The shadow gets longer from summer to fall. The shadow even gets longer from fall to winter.)
  8. Why does the shadow do what it is doing? (From spring to summer, Utah gets closer to direct sunlight. From summer to fall, Utah gets farther away from direct sunlight. From fall to winter, Utah gets even farther away from direct sunlight.)
  9. What will happen to the shadow of the nail from winter to spring and why? (The shadow on Utah will get smaller since the sun's direct sunlight will be a little closer to Utah.)