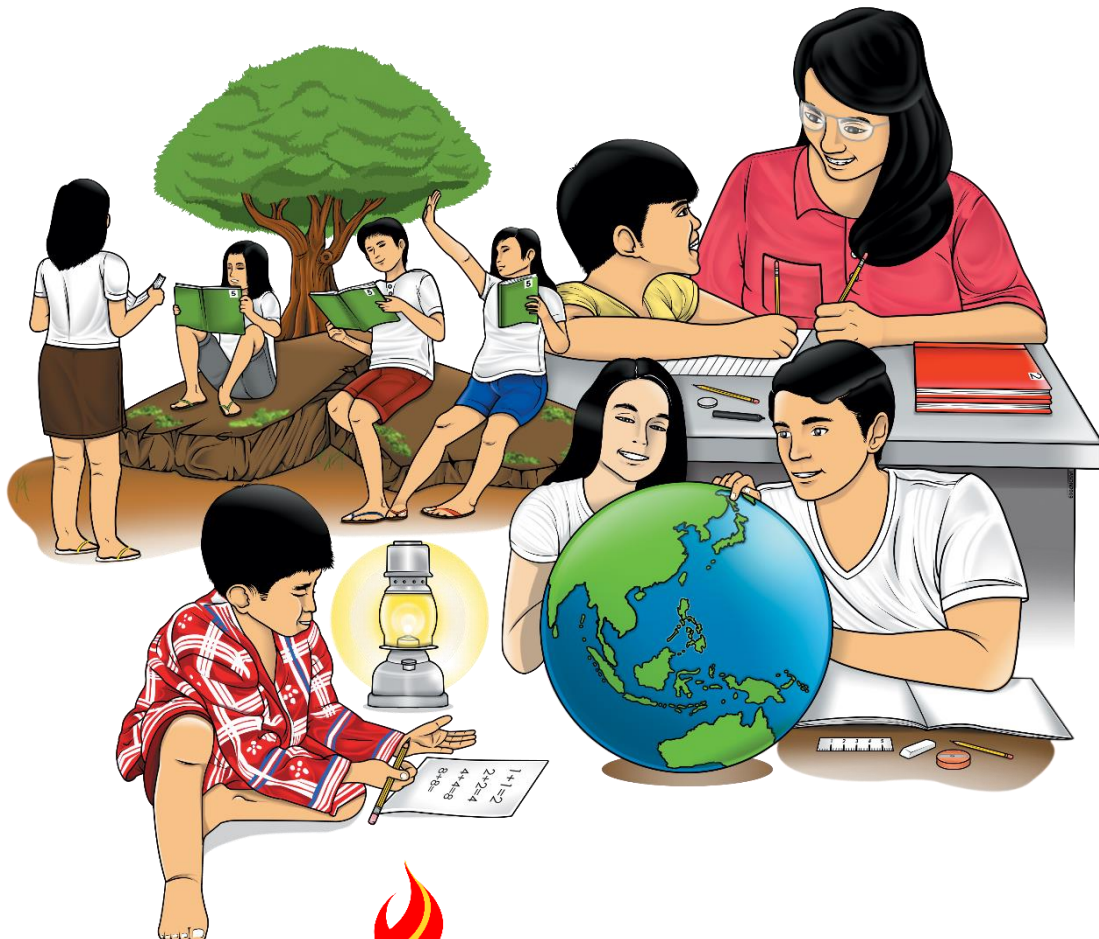


# Science

## Quarter 4 – Module 8: A Shining, Shimmering, Splendid Light in the Sky



**Science – Grade 7**  
**Alternative Delivery Mode**  
**Quarter 4 – Module 8: A Shining, Shimmering, Splendid Light in the Sky**  
**First Edition, 2020**

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**Development Team of the Module**

**Writers:** Cherry Mae B. Candelario

**Editors:** Cynthia S. Bustillo, Miraflor O. Albios, Lenie G. Forro, Rian S. Linao

**Reviewers:** Agabai S. Kabdalayang, Yusof A. Aliudin, Mary Joy D. Bautista, and  
Mary Anne A. Barrientos

**Layout Artist:** Glen D. Napoles, Allan T. Basubas

Jaypee K. Balera, Sharon Rose S. Boguen

**Management Team:** Allan G. Farnazo

Isagani S. Dela Cruz

Gilbert B. Barrera

Arturo D. Tingson, Jr.

Peter Van C. Ang-ug

Elpidio B. Daquipil

Juvy B. Nitura

Lenie G. Forro

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**Department of Education – Region XII (SOCCSKSARGEN)**

Office Address: Regional Center, Brgy. Carpenter Hill, City of Koronadal

Telefax: (02) 634- 1054, 6340 1072

E-mail Address: region12@deped.gov.ph

# Science

**Quarter 4 – Module 8:  
A Shining, Shimmering, Splendid  
Light in the Sky**

## **Introductory Message**

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



## ***What I Need to Know***

Good day, kids! How are you today? Do you know that sun is considered as a star and one of the most important astronomical objects? Yes, because it provides light and warmth. Its motion through our sky causes day and night, and varied climates.

On any given day, the sun moves through our sky in the same way as a star. It seems to rise somewhere along the eastern horizon and seems to set somewhere in the west. But how does the height of the sun in the sky affect the amount of energy received in a certain place?

In this module, you will understand how the places across the globe vary in the amount of energy received from the sun. Knowing these skills is very essential in your future use especially in the field of science. What is the relationship of the sun's position in the sky with the energy received by a certain place?

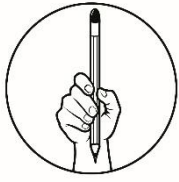
### **Most Essential Learning Competency:**

Using models, relate the height of the sun in the sky to the amount of energy received. **(S7ES-IVh-9).**

This module focuses specifically on the angle of light.

After going through this module, you are expected to:

- describe how the height of the sun affects to the amount of energy received by a certain place on Earth; and
- how is the amount of energy received related to seasons?

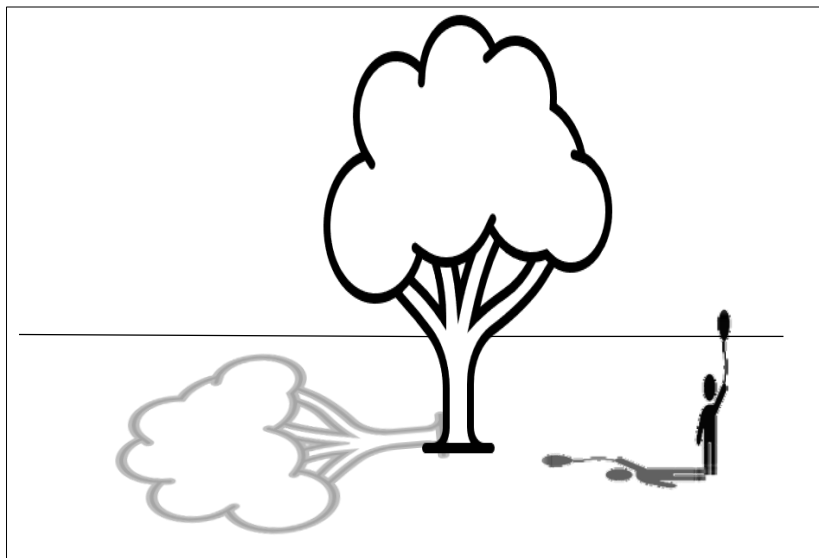


## ***What I Know***

**Directions:** Read each item carefully. Write only the letter of the correct answer for each question on a separate sheet of paper.

1. Which celestial body does Earth revolve around on?
  - A. Mars
  - B. Moon
  - C. Star
  - D. Sun
2. Which part of the Earth experiences summer in December and winter in June?
  - A. Northern hemisphere since the sun is tilted towards it in June and December.
  - B. Northern hemisphere because it receives direct rays from the sun in December and lesser in June.
  - C. Southern hemisphere because it receives direct rays from the sun in December and lesser solar energy in June.
  - D. Both southern and northern hemisphere because they receive equal rays directed from the sun in December and June.
3. Where is the Philippines located?
  - A. Polar region
  - B. Arctic region
  - C. Tropical region
  - D. Temperate region
4. What causes seasons throughout the year?
  - A. the sun and its orbit
  - B. the moon and the stars
  - C. the tilt of the Earth's axis
  - D. the distance of Earth and the moon
5. What do "direct rays" mean?
  - A. The rays of the Sun hit the ground at 30 degrees.
  - B. The rays of the Sun hit the ground at 60 degrees.
  - C. The rays of the Sun hit the ground at 90 degrees.
  - D. The rays of the Sun hit the ground at 120 degrees.
6. What is the season when Earth's axis is tipped toward the Sun?
  - A. Autumn
  - B. Fall
  - C. Summer
  - D. Winter
7. What is the season when Earth's axis is tipped away from the Sun?
  - A. Autumn
  - B. Fall
  - C. Summer
  - D. Winter

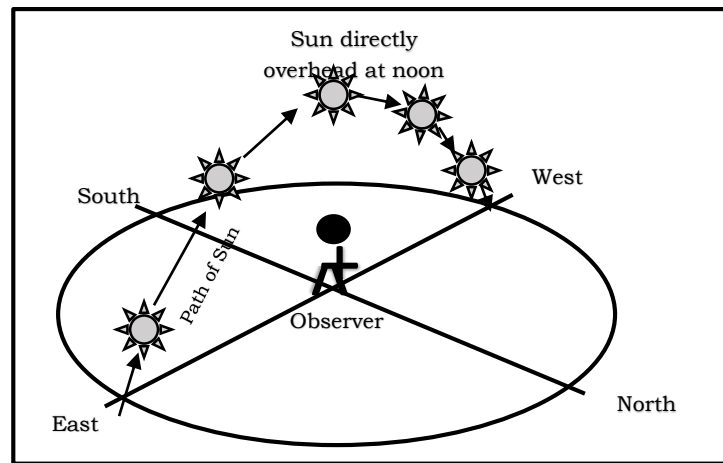
8. When the Sun's light shines on the North Pole, what season is beginning in the northern hemisphere?
- A. Autumn
  - B. Fall
  - C. Summer
  - D. Winter
9. Earth's seasons are caused by which of the following?
- A. The varying amount of sunspot activity
  - B. The rotation of the Earth during a 24- hour day
  - C. The Earth's orbit around the Sun as an ellipse rather than a circle.
  - D. The tilt of the Earth's axis of rotation relative to the orbit of the Earth.
10. The diagram below shows the noontime shadows cast by a student and a tree.



Illustrated by: Cherry Mae B. Candelario

- At noon, the student is in Manila, in what direction is the student facing?
- A. East
  - B. North
  - C. South
  - D. West

11. The diagram below shows the apparent path of the Sun as viewed by an observer at a certain part on the Earth on March 21.

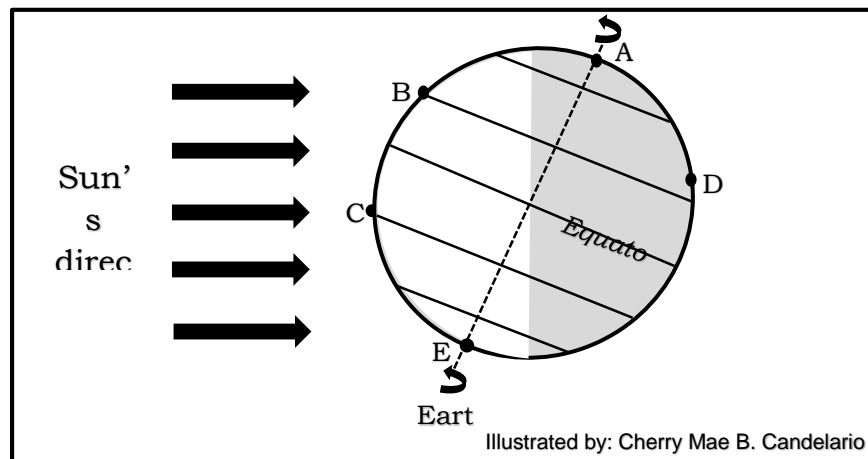


Illustrated by: Cherry Mae B. Candelario

Which latitude is the observer located?

- A. The Equator ( $0^\circ$ )
- B.  $23.5^\circ$  N
- C.  $66^\circ$  N
- D.  $90^\circ$  N

For items 12 to 14, study the diagram below, which shows the tilt of Earth on its axis in relation to the Sun on one particular day. Points A and E are locations on Earth's surface. Point D is in New York State. The dashed line represents Earth's axis.

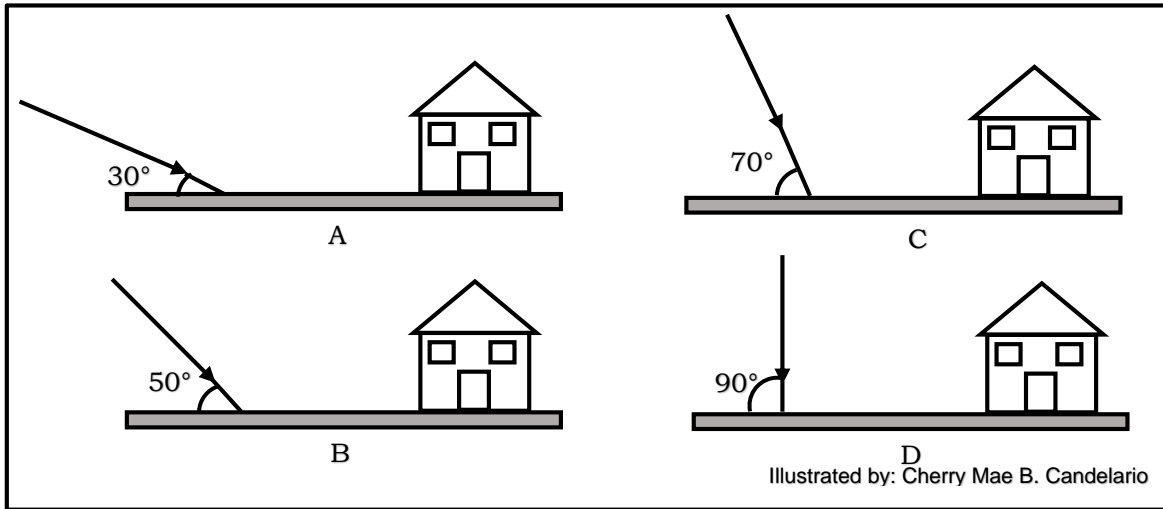


Illustrated by: Cherry Mae B. Candelario

12. Which part of the Earth receives the direct rays of the Sun?
- A. Point B
  - B. Point C
  - C. Point D
  - D. Point E
13. At which location has the greatest number of hours of daylight?
- A. Point B
  - B. Point C
  - C. Point D
  - D. Point E



14. Which diagram best represents the angle of the Sun's rays at location C at noon?



15. Why do we experience the changing of the season on the Earth?

- A. Because of the rotation of the Earth
- B. Because of the tilt of the Earth's axis
- C. Because of the change in solar output
- D. Because of the Earth's distance from the Sun

## Lesson

# 1

## Earth's Position and The Amount of Energy Received



### What's In

Hello kids! In the previous modules, you have learned that the Earth is tilted at  $23.5^\circ$  on its axis.

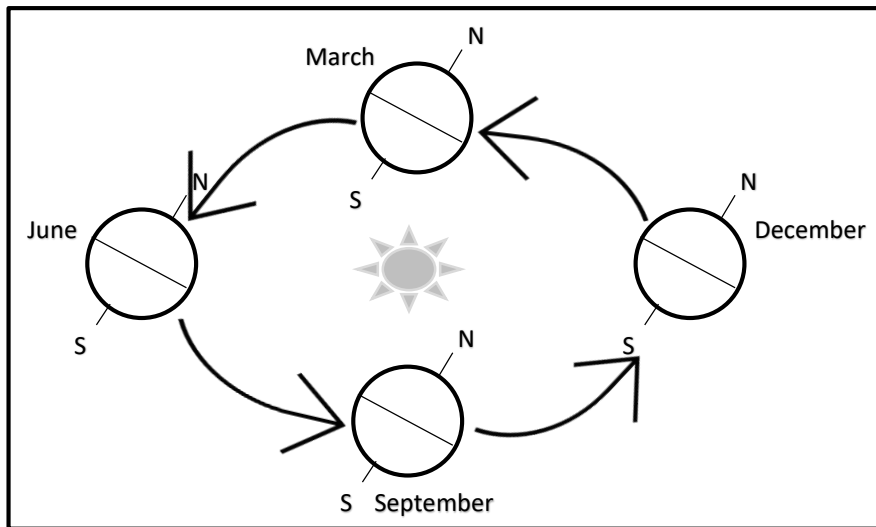
As you can remember, the Earth is divided into two hemispheres the Northern and Southern Hemisphere. In the Northern hemisphere, we can notice that Tropic of Cancer lies at  $23.5^\circ$  North and Arctic Circle at  $66.5^\circ$  N and in the Southern hemisphere, lies the Tropic of Capricorn at  $23.5^\circ$  South and Antarctic Circle at  $66.5^\circ$  S.

You have also learned that the position of the Earth on its axis shows how much direct rays from the sun it will receive.

Let's try if you can locate the location of the Earth at different times of the year.

#### WHAT TO DO:

1. Study Figure 1 below.
2. Answer the two questions on a separate sheet of paper.



Illustrated by: Cherry Mae B. Candelario

**Guide Questions:**

Q1: In which month is the North Pole tilted toward the Sun?

Q2: In which month is the North Pole tilted away from the Sun?



***What's New***

Are you now interested with our lesson? I hope that you will find our activities and discussions in this module more enjoyable and more meaningful. Are you excited? Let us start!

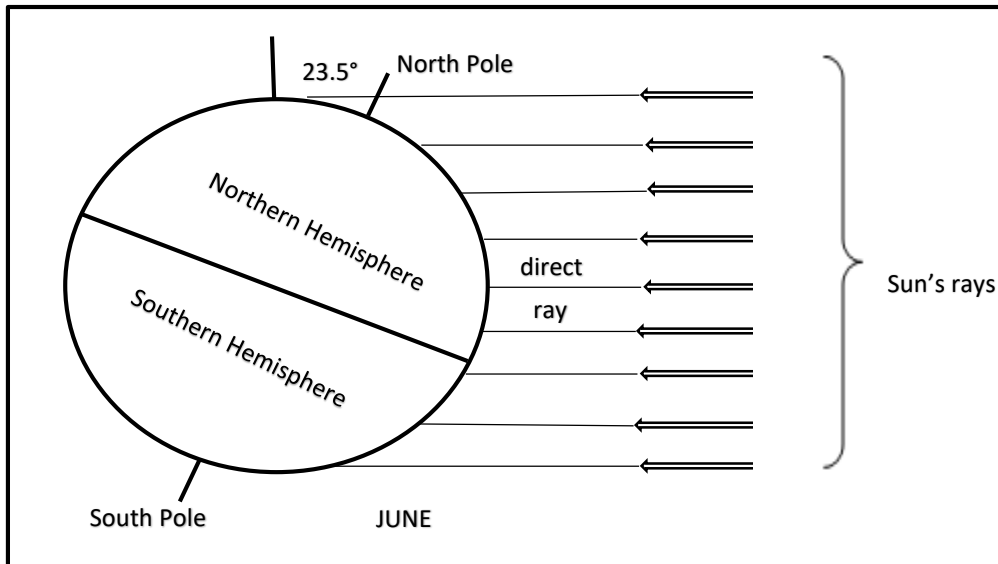
We know that the Philippines has two seasons: rainy and dry. You might have noticed that there are months of the year when it is cold and months when it is hot. These seasons follow each other regularly and you can tell in advance when it is going to be warm or cold and when it is going to be rainy or not.

Now, let us try to have another activity.

## Activity 1.1: What's The Angle Got To Do With It?

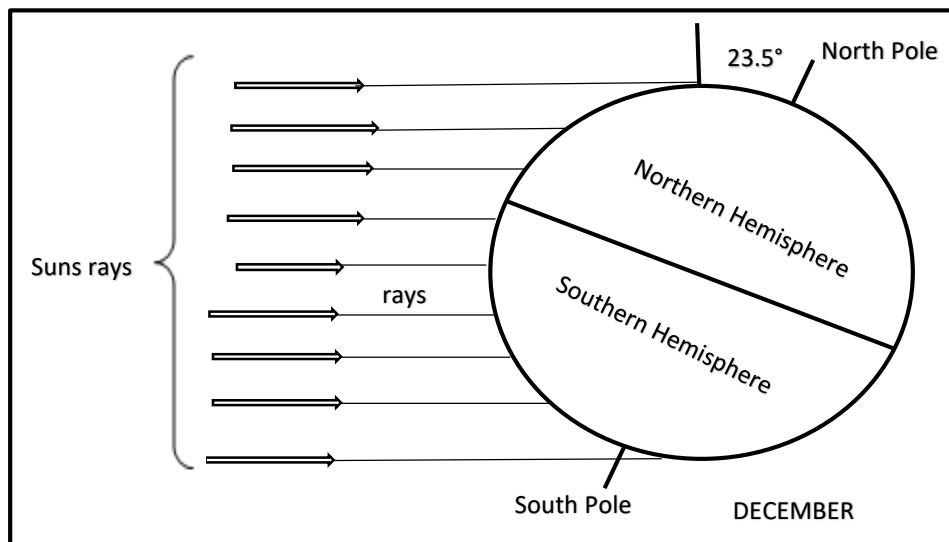
### WHAT TO DO:

1. Analyze the figure below.
2. Answer the given questions on a separate sheet of paper.



Illustrated by: Cherry Mae B. Candelario  
*Figure 2.*

**Q1:** In June, which hemisphere receives more direct rays from the sun. Why?



Illustrated by: Cherry Mae B. Candelario  
*Figure 3.*

**Q2:** In December, which hemisphere receives more direct rays from the sun. Why?



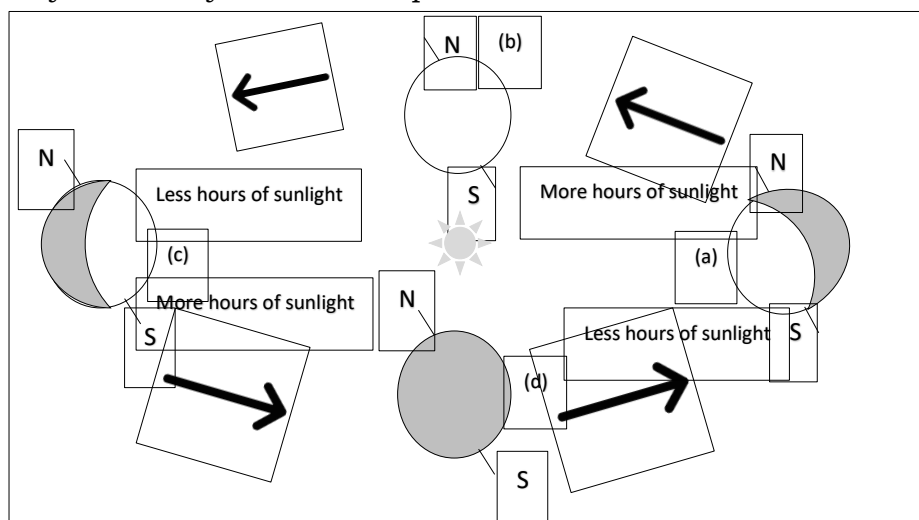
## What is It

In our country, you may have noticed that it is usually hottest during noon. You may also have observed that it is cooler during early hours of the morning and the hours just before sunset. During these times, the sun's rays reach Earth's surface at an angle, causing the relatively cooler temperature. But as the weeks and months pass, you'll notice that the sun's motion isn't quite the same as that of other stars. For one thing, the sun takes a full 24 hours to make a complete circle around the celestial sphere based on the apparent daily motion. For obvious reasons, we define our day based on the motion of the sun. Moreover, the location of the sun's path across the sky varies with the seasons. But can you explain why there are seasons? Do you know why the seasons change?

In June, the Northern Hemisphere will receive more direct rays from the sun (Figure 2). Therefore, it is summer in the Northern Hemisphere at this time. While, in December, the North Pole will be pointing away from the Sun (Figure 3), and the Southern Hemisphere will receive more direct rays from the sun. The Northern Hemisphere will then experience a time of cold temperature. For temperate countries in the Northern Hemisphere, it will be winter. In tropical countries like Philippines, it is simply a cold season.

The varying amounts of sunlight the Earth receives during different times of the year creates the seasons. **Seasons** are the weather changes due to varied amounts of sunlight caused by the tilt of the Earth's axis. Thus, at certain times of the year, one part of the planet is more directly exposed to the sun's rays than the other parts.

Temperate countries found between  $23.5^\circ$  North and South latitudes, and between  $66.5^\circ$  North and South latitudes experience the four seasons- spring, summer, autumn, and winter. However, the Philippines is a tropical country having two seasons- rainy and dry that's why we do not experience winter season at all.



Illustrated by: Cherry Mae B. Candelario

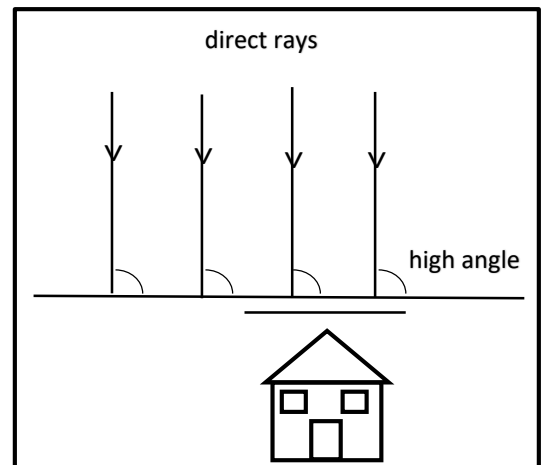
**Figure 4.** Different seasons on Earth (with reference to the Northern Hemisphere): (a) summer, (b) autumnal equinox, (c) winter, and (d) spring or vernal equinox.

During different seasons, the angle at which the sun's rays hit the Earth varies. "Direct rays" means that the rays of the Sun hit the ground at 90°. The rays are vertical or perpendicular to the ground. When the Sun's rays strike the ground at a high angle, each square meter of the ground receives a greater amount of solar energy than when the rays are inclined. This results to more heat being absorbed by the Earth's surface.

In the tropics, the warm season is due to the Sun's rays hitting the ground directly. To an observer, the position of the Sun at noon will be exactly overhead.

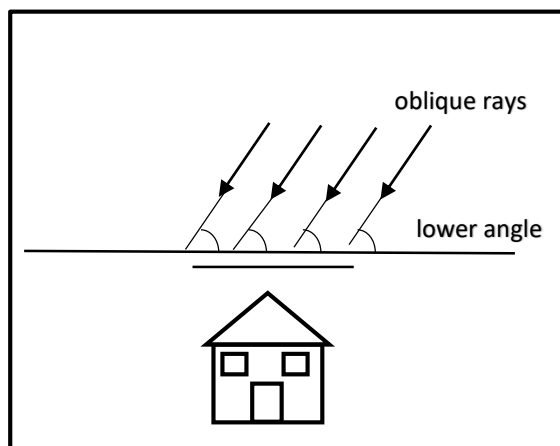
On the other hand, when the Sun's rays come in at an angle, each square meter of the ground will receive a lesser amount of solar energy. That's because at lower angles, solar energy will be distributed over wider area. The place will then experience lower temperatures.

After another six months, in June of the following year, the Earth will have made one full trip around the Sun. The Sun's direct rays will fall on the Northern Hemisphere once more. It will be warm in the Northern Hemisphere and cold in the Southern Hemisphere all over again. Thus, the seasons change because the direct rays of the Sun shift from one hemisphere to the other as the Earth goes around the Sun.



Illustrated by: Cherry Mae B. Candelario

**Figure 5.** In the tropics, the warm season is due to the Sun's rays hitting the ground directly. To an observer, the position of the Sun at noon will be exactly overhead.



Illustrated by: Cherry Mae B. Candelario

**Figure 6.** The cold season is the result of the Sun's rays striking the ground at a lower angle. To an observer, the Sun at midday will not be directly above; it will be lower in the sky.

If the Sun is positioned directly overhead or at 90 degrees from the horizon, the incoming insolation strikes the surface of the Earth at right angles and is most intense. If the Sun is at 45 degrees above the horizon, the incoming insolation strikes the Earth's surface at an angle. This causes the rays to be spread over a larger surface area reducing the intensity of radiation.



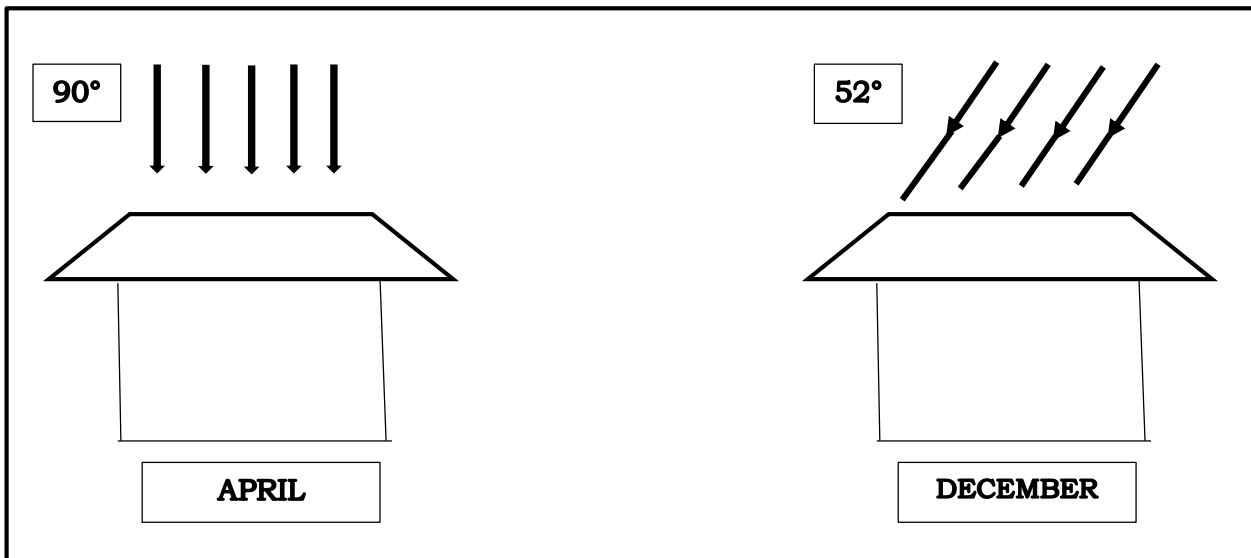
## What's More

Are you getting familiar how the height of the sun affects the amount energy received by the Earth? Let us try another activity to deepen your understanding. Are you ready? Let's start!

### Activity 1.2: The Angle of Light

#### Procedures:

1. Study the figure below.
2. Write your answer on a separate sheet of paper.
3. Refer to the rubric below in completing this activity.



Illustrated by: Cherry Mae B. Candelario

Figure 7. The rays of the Sun in April and December

#### Guide Questions:

**Q1:** Why is it warmer in April than in December?

**Q2:** Does the apparent path of the Sun across the sky change during the year? Why?

### Scoring Rubric

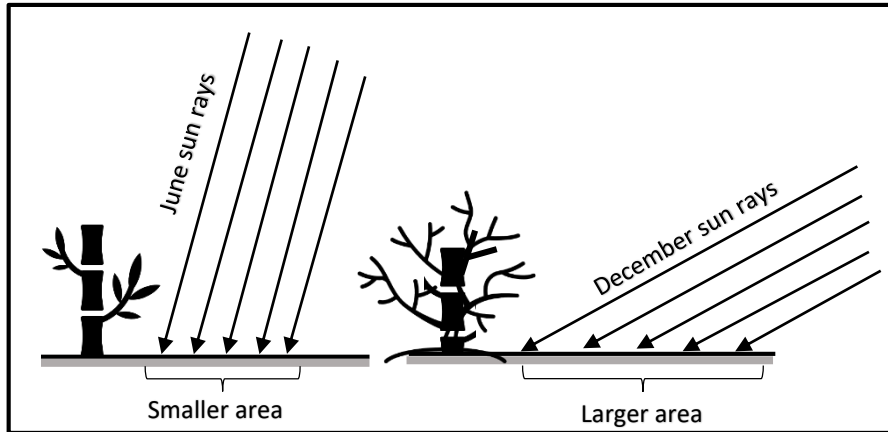
<b>Criteria</b>	<b>4 Outstanding</b>	<b>3 Proficient</b>	<b>2 Developing</b>	<b>1 Beginning</b>
Content	<ul style="list-style-type: none"> <li>• Piece was written with specific, informative, and well organized</li> <li>• It presents relevance, substantial, and illustrative ideas developed through facts, reasons, and/or explanations.</li> </ul>	<ul style="list-style-type: none"> <li>• Piece was written in an interesting style</li> <li>• Somewhat informative and organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had little style</li> <li>• Gives some new information but poorly organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had no style</li> <li>• Gives no new information and very poorly organized</li> </ul>
Grammar, Usage & Mechanics	<ul style="list-style-type: none"> <li>• No incorrect spelling, punctuation or grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• Few spelling and punctuations, errors, minor grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• A number of spelling, punctuation or grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• So many spelling, punctuation and grammatical errors that it interferes with the meaning</li> </ul>



## What I Have Learned

Now that you have learned a lot from our module, let us test your understanding with our lesson by answering this activity. Are you ready? Let us start the ball rolling.

**Directions:** Study the illustration below. Explain how the Sun’s motion affects solar energy received by the area. Refer to the scoring rubric below in completing this task. Write your answers on a separate sheet of paper.

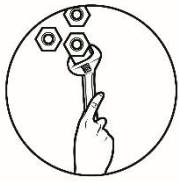


Illustrated by: Cherry Mae B. Candelario

### Scoring Rubric

Criteria	4 Outstanding	3 Proficient	2 Developing	1 Beginning
Content	<ul style="list-style-type: none"> <li>Piece was written with specific, informative, and well organized</li> <li>It presents relevance, substantial, and illustrative ideas developed through facts, reasons, and/or explanations.</li> </ul>	<ul style="list-style-type: none"> <li>Piece was written in an interesting style</li> <li>Somewhat informative and organized</li> </ul>	<ul style="list-style-type: none"> <li>Piece had little style</li> <li>Gives some new information but poorly organized</li> </ul>	<ul style="list-style-type: none"> <li>Piece had no style</li> <li>Gives no new information and very poorly organized</li> </ul>
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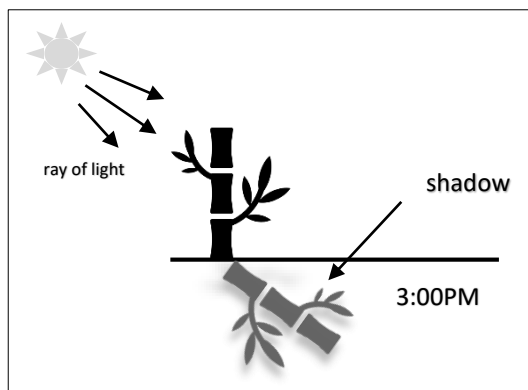
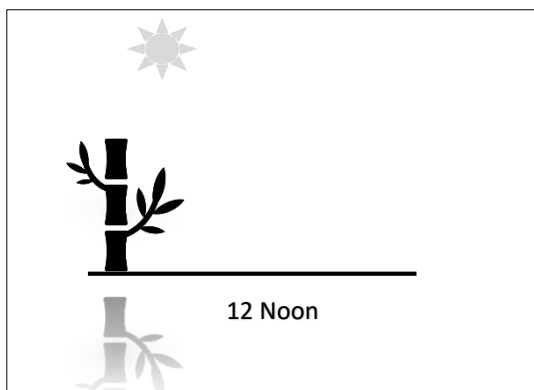
## What I Can Do

Congratulations! You are fantastic and I hope you enjoyed your exploration about the light rays from the Sun. Here is your final challenge to prove what you got. Write your answers on a separate sheet of paper.

### Directions:

1. Try to stand-up under the sun at 12 noon for a minute. What have you observed in your shadow? How intense is the heat of the sun during this time (12 noon)? Write your observations. (*You can use your umbrella to avoid sunburn and heatstroke.*)
2. This time, look in your surroundings at 3:00 in the afternoon. What have you noticed with the shadows of the plant outside? How intense is the heat of the sun during this time?
3. Refer to the scoring rubric below in accomplishing this task.

If sun is not present in the sky due to a bad weather, use the given pictures below. Answer the guide questions on your activity notebook.



Illustrated by: Cherry Mae B. Candelario

### Guide Questions:

1. At what angle is the Sun located in 12 Noon? 3:00 PM? (*You can use protractor for measuring the angle in the figure above.*)
2. What have you observed between the shadow at 12 Noon and at 3:00 PM?
3. At what time did the ground receive the most direct rays of the sun?
4. How does the amount of energy received by the ground at noon and at 3:00pm compare?

### Scoring Rubric

<b>Criteria</b>	<b>4 Outstanding</b>	<b>3 Proficient</b>	<b>2 Developing</b>	<b>1 Beginning</b>
Content	<ul style="list-style-type: none"> <li>• Piece was written with specific, informative, and well organized</li> <li>• It presents relevance, substantial, and illustrative ideas developed through facts, reasons, and/or explanations.</li> </ul>	<ul style="list-style-type: none"> <li>• Piece was written in an interesting style</li> <li>• Somewhat informative and organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had little style</li> <li>• Gives some new information but poorly organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had no style</li> <li>• Gives no new information and very poorly organized</li> </ul>
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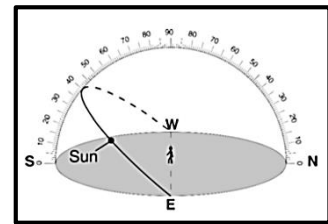
## Assessment

**Directions:** Read each item carefully. Write only the letter of the correct answer for each question on a separate sheet of paper.

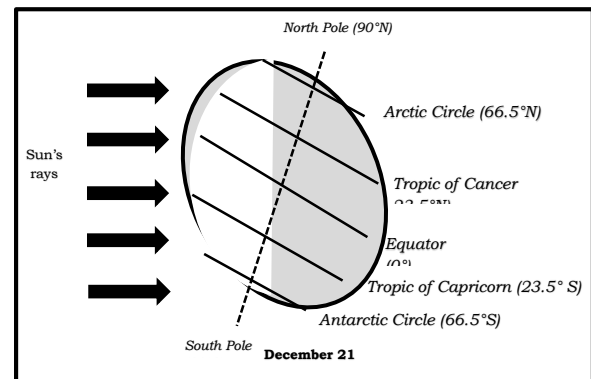
1. What are the two seasons in the Philippines?
  - A. Rainy and Dry
  - B. Rainy and Fall
  - C. Dry and Winter
  - D. Summer and Winter
2. In the month of June, which area receives more direct rays from the sun?
  - A. North Pole
  - B. South Pole
  - C. Temperate Zone
  - D. Equatorial Region
3. When it is summer in southern hemisphere, which of the following BEST describes the tilting of the Earth in the northern hemisphere?
  - A. Towards the sun
  - B. Away from the sun
  - C. Towards or away from the sun
  - D. Toward or away from the moon
4. What happens during equinox?
  - A. The length of day and night is equal.
  - B. The length of day and night is not the same.
  - C. The sunlight is lesser at the other hemisphere than the other.
  - D. The sunlight is greater at the other hemisphere than the other.
5. What do you call the changing of weather due to varied amounts of sunlight?
  - A. Eclipse
  - B. Revolution
  - C. Rotation
  - D. Seasons
6. At which latitude can the sun be observed directly overhead during summer solstice?
  - A. 23.5° N
  - B. 33.5° N
  - C. 42° N
  - D. 66.5° N
7. A person is facing his shadow at noon. What direction is he facing?
  - A. East
  - B. North
  - C. South
  - D. West

8. Seasonal changes on Earth are primarily caused by the \_\_\_\_\_.
- elliptical shape of Earth's orbit around the Sun
  - changes in distance between Earth and the Sun
  - tilt of the Earth's axis as Earth revolves around the Sun
  - parallelism of the Sun's axis as the Sun revolves around Earth
9. Because the Earth rotates on its axis, in what direction does the sun seem to rise?
- East
  - North
  - South
  - West
10. Very cold climates occur at Earth's North and South Poles because the polar regions \_\_\_\_\_.
- receive low- angle insolation
  - are usually farthest from the equator
  - receive the most hours of daylight
  - absorb the greatest amount of insolation
11. During summer, countries in the Northern Hemisphere experience warm temperatures because sunlight then is \_\_\_\_\_.
- least intense and of longest duration
  - most intense and of longest duration
  - least intense and of shortest duration
  - most intense and of shortest duration

12. What time of the day is represented by the location of the Sun on the diagram? Refer to the diagram.
- 6 AM
  - 9 AM
  - 6 PM
  - 12 PM

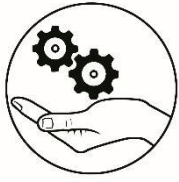


13. In the diagram, on December 21<sup>st</sup>, what latitude experiences direct Sun rays?
- 0°
  - 23.5° N
  - 23.5° S
  - 66.5° S



Illustrated by: Cherry Mae B. Candelario

14. Why does the area around the equator has the same temperature throughout the year?
- The equator has 18-hour days.
  - The equator rotates slower than the poles.
  - The equator always receives sunlight at high angles.
  - The equator remains the same distance from the Sun.
15. Why do seasons change?
- The sun is directed to the southern hemisphere only.
  - The sun is somehow tilted to both Northern and Southern hemisphere.
  - Seasons change because the Earth is stationary directing its rays to Northern hemisphere always.
  - Seasons change because direct rays of the Sun shift from one hemisphere to the other as the Earth goes around the Sun.



## ***Additional Activities***

Good job! You have come this far. I know that you are knowledgeable enough with our lesson. For your additional learning, you can use the table below as your guide to answer the given questions. Write your answer on a separate sheet of paper. Refer to the scoring rubric below in accomplishing this task.

<b>Day</b>	<b>Height of the Sun (Altitude)</b>	<b>Day</b>	<b>Height of the Sun (Altitude)</b>
Jan. 22, 2011	55.6°	Jul. 22, 2011	84.3°
Feb. 22, 2011	65.1°	Aug. 22, 2011	87.3°
Mar. 22, 2011	75.9°	Sept. 22, 2011	75.9°
Apr. 22, 2011	87.4°	Oct. 22, 2011	64.5°
May 22, 2011	84.3°	Nov. 22, 2011	55.4°
Jun. 22, 2011	81.2°	Dec. 22, 2011	52.0°

### **Guide Questions:**

1. In what month of the year can we experience cold season in our country? Why?
2. Which month is the North Pole tilted toward the Sun? How did you know?
3. What is the relationship between the height of the Sun to the energy received by the ground?
4. Why is it hotter during certain months of the year?

### Scoring Rubric

<b>Criteria</b>	<b>4 Outstanding</b>	<b>3 Proficient</b>	<b>2 Developing</b>	<b>1 Beginning</b>
Content	<ul style="list-style-type: none"> <li>• Piece was written with specific, informative, and well organized</li> <li>• It presents relevance, substantial, and illustrative ideas developed through facts, reasons, and/or explanations.</li> </ul>	<ul style="list-style-type: none"> <li>• Piece was written in an interesting style</li> <li>• Somewhat informative and organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had little style</li> <li>• Gives some new information but poorly organized</li> </ul>	<ul style="list-style-type: none"> <li>• Piece had no style</li> <li>• Gives no new information and very poorly organized</li> </ul>
Grammar, Usage & Mechanics	<ul style="list-style-type: none"> <li>• No incorrect spelling, punctuation or grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• Few spelling and punctuations, errors, minor grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• A number of spelling, punctuation or grammatical errors</li> </ul>	<ul style="list-style-type: none"> <li>• So many spelling, punctuation and grammatical errors that it interferes with the meaning</li> </ul>



# Answer Key

**What I Know**

1. D
2. C
3. C
4. C
5. C
6. C
7. D
8. C
9. D
10. B
11. A
12. D
13. B
14. D
15. B

**What's In**

1. June, the Northern Hemisphere receives direct rays from the North pole is tilted toward the Sun.
2. In December, the Southern Hemisphere receives direct rays from the South Pole is tilted toward the Sun.

**What's More**

1. It is warmer in April than in the month of December because the rays of the Sun hit the ground at 90 degrees. The rays are vertical or perpendicular to the ground. The closer the height of the Sun is to 90 degrees, the "warmer" the month.
2. The apparent path of the Sun across the sky changes during the year because the Earth is rotating on its own axis and revolving around the Sun, so each day of the year, the Earth is at a different point in its orbit. Because the Earth is facing the Sun at different angle each day, the "path" the Sun makes in the sky will be different each day of the year.

**What I Have Learned**

1. In June, the Sun's rays strike the ground at a high angle, each square meter of the ground receives a greater amount of solar energy when the rays are inclined resulting in greater warming, while it is cooler in December because the Sun's rays hit the ground obliquely. Oblique rays spread the solar energy over a wider area.

**What I Can Do**

1. 12 Noon @ 90 degrees; 3pm @ 52 degrees
2. In April the North Pole is tilted toward the Sun because the height of the Sun is closer to 90 degrees which means that the temperature is much intense.
3. The ground receive the most direct rays of the sun at 12noon.
4. The amount of energy received by the ground at noon is at a greater amount resulting in "great warming" while in 3pm it is less hot because the Sun is much lower in the sky at approximately 52 degrees.

Assessment

1. A
2. A
3. A
4. A
5. D
6. A
7. D
8. D
9. A
10. A

**Additional Activities**

1. In December we experience cold season in our country because the height of the Sun is much lower in the sky at 52 degrees.
2. In April the North Pole is tilted toward the Sun. The closer the height of the sun is to 90 degrees the "warmer" the month.
3. There is direct relationship between the height of the sun and the energy received by the ground. The Sun's rays strike the ground at high angle the greater amount of solar energy receives by the ground.
4. It is hotter during certain month of the year because the height of the sun is closer to 90 degrees. The ground receives direct rays from the Sun.

## ***References***

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**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex  
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: [blr.lrqad@deped.gov.ph](mailto:blr.lrqad@deped.gov.ph) \* [blr.lrpd@deped.gov.ph](mailto:blr.lrpd@deped.gov.ph)