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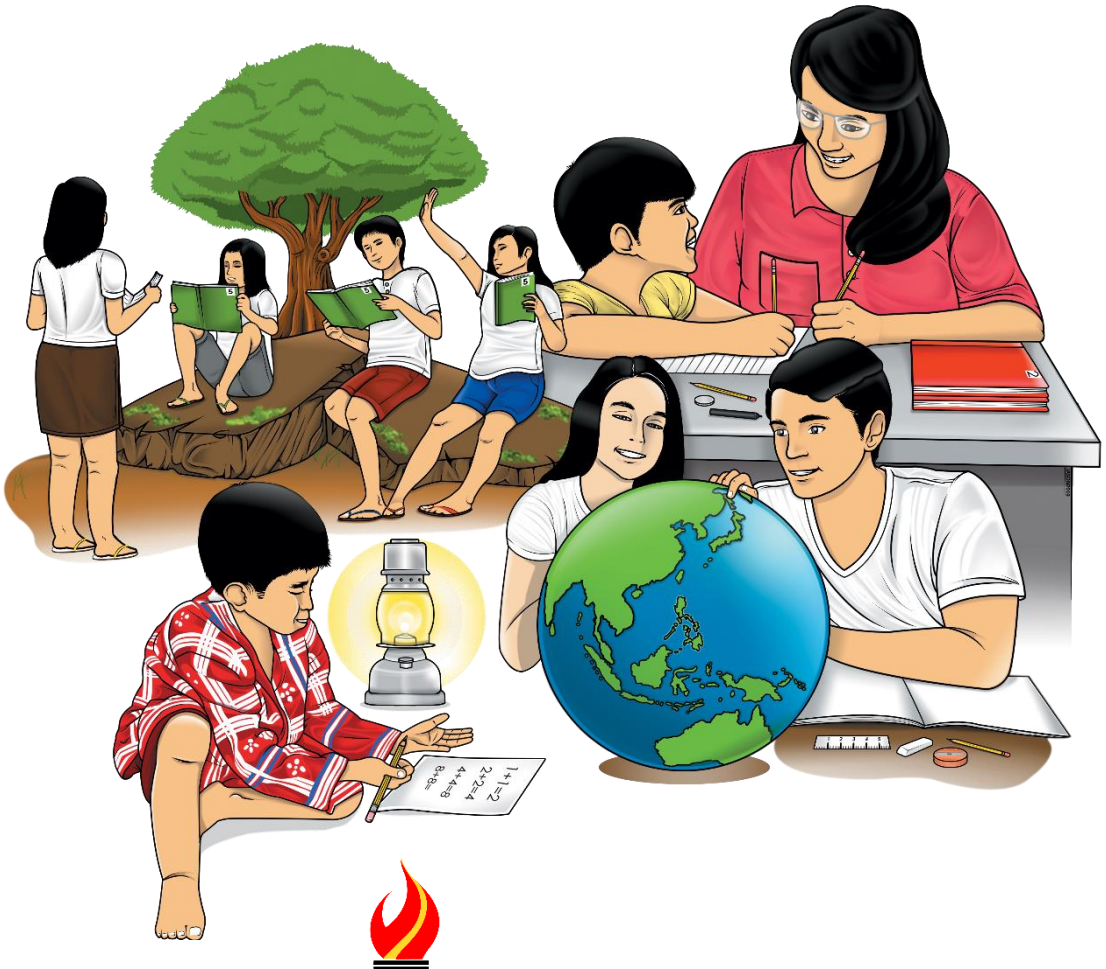
DEPARTMENT OF EDUCATION

Science

Quarter 4- Module 9:
Coordinates and Me



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Science

Quarter 4 – Module 9: Coordinates and Me

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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

Many people think that the seasons results from the changes in the Earth-Sun distance this belief is incorrect. In fact, the amount of solar energy per unit of Earth's surface area depends on latitude. Let's start, explore and find out more.

MOST ESSENTIAL LEARNING COMPETENCIES:
Use models to relate the latitude of an area to the amount of energy the area receives (**S7ES-IVh-9**)

After going through this module you are expected to:

1. identify the important lines of latitude
2. explain how the latitude affects the amount of energy received in an area
3. determine the relation between the lines of latitude and seasons

What I Know

Directions: Read and understand each question carefully. Write your answer on a separate sheet of paper.

1. What are vertical lines, or lines running up and down the Earth from North to South, called?
   A. Equator
   B. Latitude lines
   C. Longitude lines
   D. Prime meridians

2. What are horizontal lines, or lines running across the Earth from East to West, called?
   A. Equator
   B. Latitude lines
   C. Longitude lines
   D. Prime meridians

3. Which affect the amount of solar energy the earth's received?
   A. Equator
   B. Latitude lines
   C. Longitude lines
   D. Prime meridians

4. Which of the following imaginary line that is halfway between the North Pole and South Pole?
   A. Equator
   B. Latitude lines
   C. Longitude lines
   D. Prime meridians

5. These are example of lines of latitude, **EXCEPT**
   A. Equator
   B. Antarctic circle
   C. Prime Meridian
   D. Tropic of cancer

6. This area is characterized with generally hot and with cold winters.
   A. 0 degree
   B. 23.5^0 N-60^0
   C. 23.5^0S-60^0
   D. 30^0 -60 ^{0}

7. Which region receives less solar energy per unit of surface area?
   A. Asian region
   B. African region
   C. Pakistan region
   D. Polar region

8. Which of the following statements correctly describes latitude?
   A. Only lines of the latitude are equally spaced vertical lines.
   B. There are 89 lines of latitude in the north and 89 to the south.
   C. The 90^{th} line of the latitude are the three points the East and North.
   D. The 90^{th} line of the latitude are the two points the North and South.

9. Evan was asked to locate the equator on the globe. He then pointed at the 0-degree latitude. Is he correct?
   A. Yes, it is halfway between the North Pole and South Pole.
   B. No, it is not 0-degree latitude at the middle of the earth.
   C. Yes, it is at 0-degree latitude around the North Pole and South Pole.
   D. No, it is an imaginary line around the earth which represent 0 degree.

10. Which of the following statements correctly describes Prime meridian?

I. It is a line of latitude II. It is a line of longitude III. It runs through Greenwich IV. It is the line of longitude at 0^o

   A. I and II only
   B. I and III only
   C. II, III and IV only
   D. I, III and IV only

Lesson 1 The Lines of the Latitude

What's In

In the previous lesson, you have learned about how the tilt of the earth results to seasons. Also, you have learned the other factors that contributes to the occurrence of seasons such as length of daylight and height of the sun above the horizon. In this module, you will relate the latitude of an area to the amount of energy the area receives as well as its effects on Earth's seasons.

Find all of the words that are hidden in the grid. The words may be hidden in horizontal, vertical or diagonal directions. Refer to the words shown inside the box.

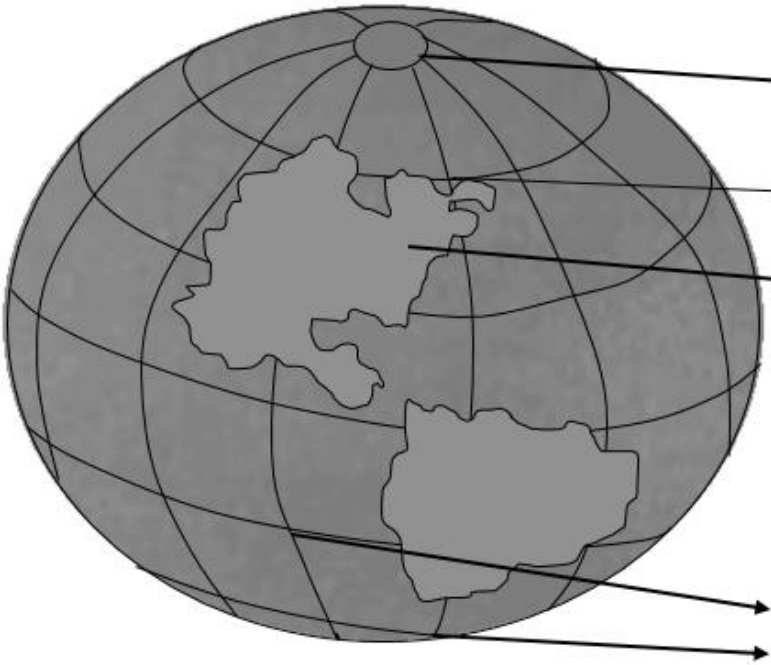
MERIDIAN	ARCTIC	POLE	CANCER
NORTH	ANTARCTIC	EQUATOR	SOUTH
TROPICAL	LATITUDE	COUNTRIES	

M	E	R	I	D	I	A	L	B	I	O	M	E	O
N	O	I	A	K	L	M	N	V	B	P	O	L	E
T	R	O	P	I	C	A	L	I	L	O	C	A	Q
A	H	S	S	L	O	R	E	Y	A	B	S	N	U
R	I	P	B	I	O	L	O	I	O	T	A	O	A
C	T	H	S	C	A	N	C	E	R	L	I	T	T
T	N	E	T	E	B	P	G	L	O	B	E	R	O
I	S	R	O	S	O	U	T	H	S	T	E	M	R
C	T	A	N	T	A	R	C	T	I	C	I	S	Y
U	U	B	H	O	M	E	R	D	I	A	N	I	A
I	H	N	N	O	R	T	H	T	R	I	O	N	E

What's New

Activity: Naming Me

Directions: Observe the picture below and identify the different lines of latitude. Write your answer on a separate sheet of paper.



Illustrated by: Jaypee K. Balera

What is It

The shape of the Earth is described as an **oblate spheroid** a sphere with flat poles and a bulging equator. Because of the spherical shape of the Earth there is uneven solar distribution. As sunlight strikes the Earth's surface, the part that faces the sun receives vertical rays, while the part that curves away from the sun receives slanting or oblique rays.

NOTES TO REMEMBER:

The Earth revolves in its orbit in a counterclockwise manner. As the Earth revolves around the sun, the sun's rays seem to sweep from northward to southward and back within the year causing the alternate change in the position of the vertical and the slanting rays of the sun. So that in the month of June, the Earth's axis is tilted towards the sun, then as the Earth revolves halfway in its orbit in the month of December the Earth's axis will be tilted away from the sun.

Latitude is the measurement of distance north or south of the Equator. It measured within 180 imaginary lines around the Earth east-west parallel to the Equator. Starting from the equator it increases from 0 to 90^0 as you move towards North Pole or South Pole. These lines are called parallel lines.

Different parts of the Earth receive different amounts of solar radiation. This is because the Sun's rays strike the Earth's surface most directly at the equator, you will notice the different areas also receive different amounts of sunlight in different seasons.

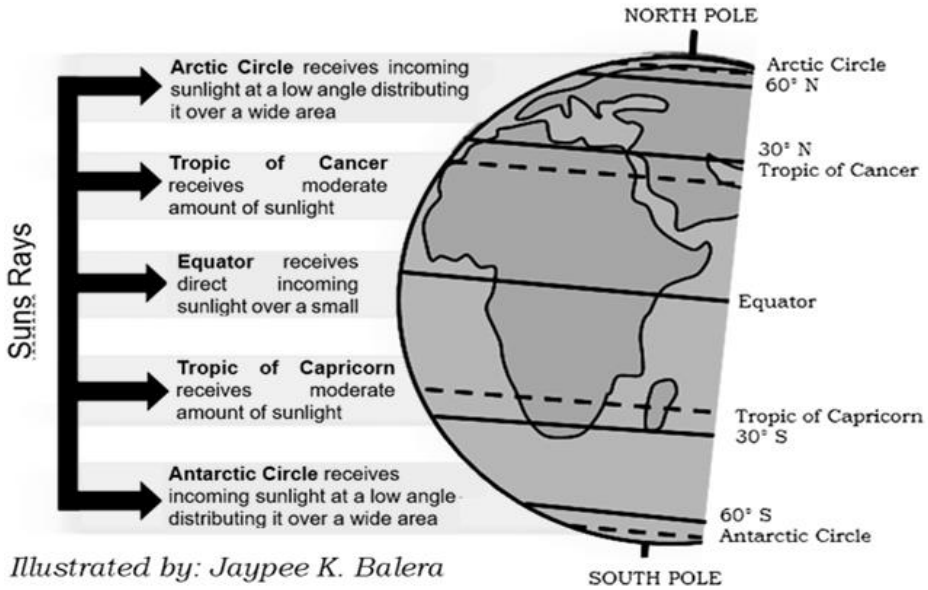
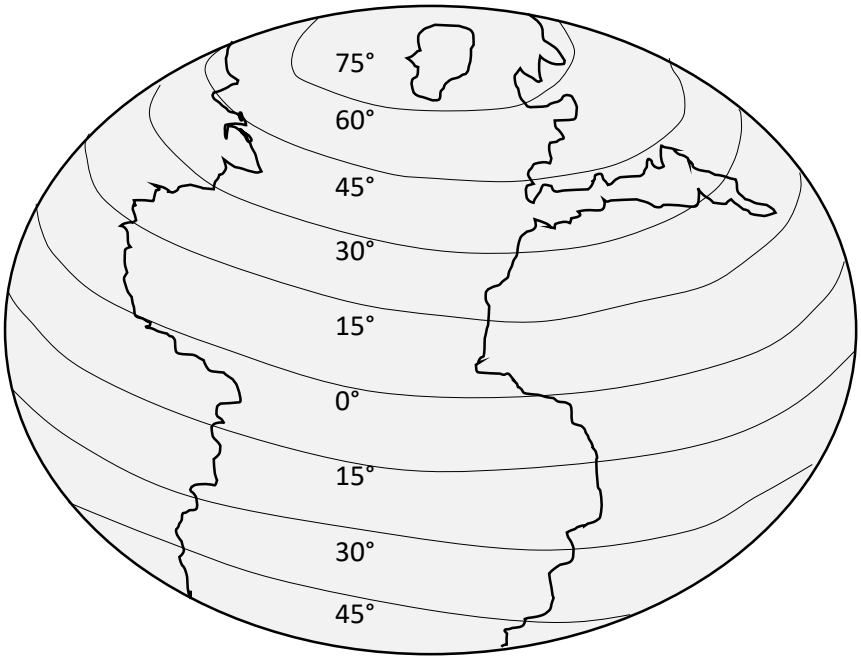


Figure 1. Parts of the Earth that receive different amounts of solar radiation.



Illustrated by: Jaypee K. Balera

The Equatorial Region

Five Important lines of latitude

a) The equator (0^{o}) it is an imaginary line around the middle of a planet. It is halfway between the North Pole and South Pole, at 0-degree latitude. It is important as a reference point for navigation and geography. The equator is hot because the sun's rays hit the Earth's surface at a higher angle all year round as seen in figure 1. The equator passes through 13 countries: Brazil, Columbia, Democratic Republic of Congo, Ecuador, Gabon, Sao Tome & Principe, Republic of Congo, Uganda, Kenya, Somalia, Maldives, Indonesia and Kiribati. If you live on the equator you will experience the quickest rate of sunrise and sunset in the world, taking a matter of minutes. This place also has a constant twelve hours of day and night throughout the year, while at the north or south of the equator, day length varies with the seasons. Equatorial regions often experience a hot climate with little seasonal variation. Many equatorial cultures recognize two seasons-wet and dry. The areas farther away from the Equator tends to be cooler. The general climate patterns might not show exceptions and variations as a result of elevation, ocean currents, precipitation and other factors.

b) Tropic of Cancer (23.5^{o} North) which is also referred to as the Northern Tropic is the most northerly circle of latitude on Earth at which the sun can be directly overhead. This occurs on the June solstice, when the Northern Hemisphere is tilted toward the sun and the area receives maximum solar energy. This area receives the most amount of solar energy at this time. The Tropic of Cancer passes through16 countries Algeria, Niger, Libya, Egypt, Saudi Arabia, Abu Dhabi UAE, Oman, India, Bangladesh, Myanmar, China, Taiwan, Mexico, Bahamas, Western Sahara, Mauritania and Mali.

c) **Tropic of Capricorn (23.5° South)** is the circle of latitude that contains the sub-solar point at the December solstice. It is the southernmost latitude where the sun can be seen directly overhead at noon. This event occurs at the December solstice, when the southern hemisphere is tilted towards the sun to its maximum extent. The tropic of Capricorn passes through a number of countries including Argentina, Australia, Botswana, Brazil, Chile, Madagascar, Mozambique, Namibia and Paraguay.

d) **The Arctic circle (66.5°North)** is one of the five major circles of the latitude that mark maps of the earth. This is the parallel of latitude that runs 66.56083 degrees north to the Equator. Because of the earth's inclination of about 23.5 degree to the vertical it marks ~~to~~ the southern limit of the area within the sun does not set during summer and the sun does not rise during winter. Although the sun does not set during summer the amount of energy received in this latitude is still less than those received in the lower altitudes. The sun hits this latitude at a lower angle and covers a much wider area as seen in figure 1, therefore decreasing the amount of energy received Everything north of this circle is known as the Arctic and the zone just to the south of this circle is the Northern Temperate Zone. The Arctic Circle passes through the Northern America, Greenland, North Asia, the Scandinavian Peninsula, and the Arctic Ocean, Norway, Sweden, Finland, Russia, United States (Alaska), Canada, Denmark, and Iceland. It has two seasons, summer and winter. The winters are some nine months long, while the summers fill in the three other months.

e) **The Antarctic circle (66.5° South)** is a parallel of latitude on the Earth. On the day of the southern summer solstice around December 22 each year an observer on the Antarctic circle will see the sun above the horizon for a full 24 hours. Similar with the Arctic circle, during summer in Antarctica, the sun that does not set hits the ground at a lower angle and covers a wider area as seen in figure 1 therefore, receiving a smaller amount of energy compared to the areas of lower latitudes. Antarctica has two seasons summer and winter.–Being located in the southern hemisphere, Antarctica's summer is from October to February. During this time, the sun is almost always in the sky, until eventually the sun doesn't set at all. Winter in Antarctica is during April to October. Antarctica is the southernmost continent and site of the South Pole. It is virtually uninhabited, and it is an ice-covered landmass.

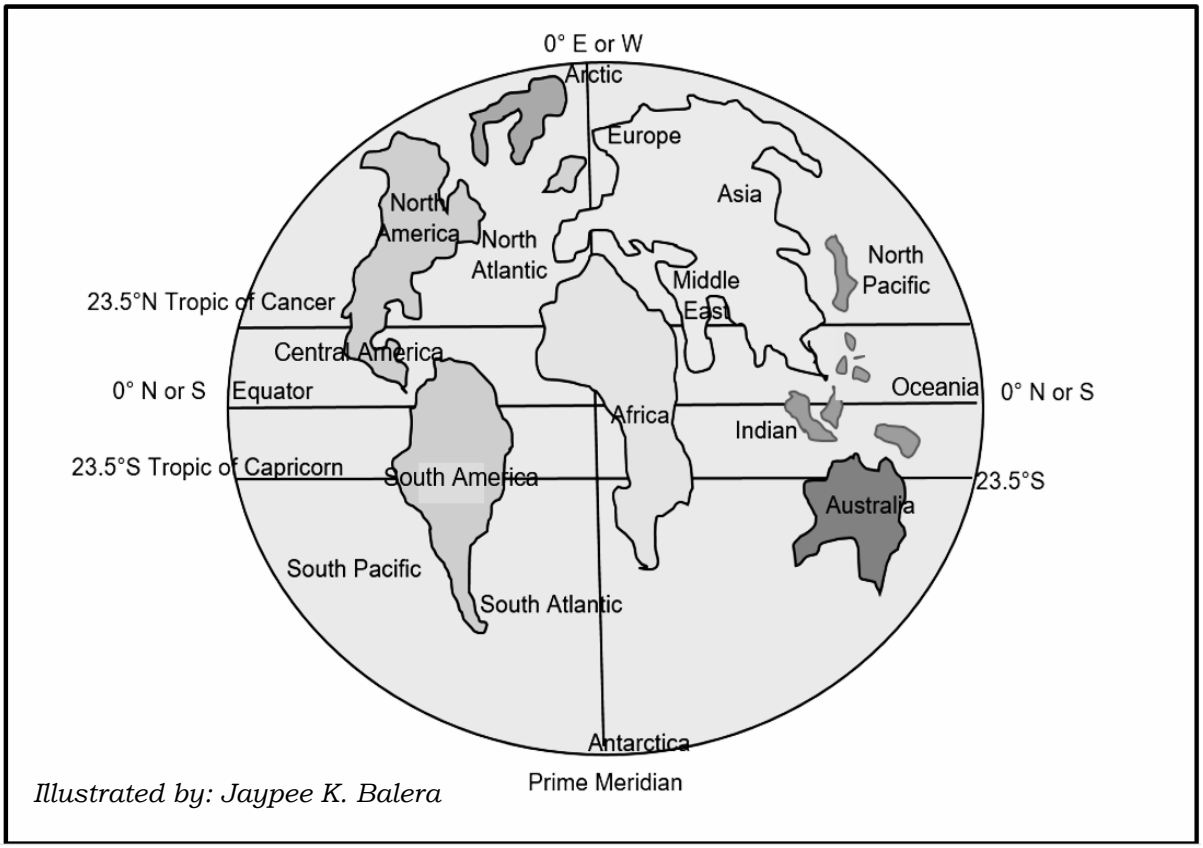


Figure 2. The Lines of Latitude

REMEMBER THIS:

Earth makes one complete revolution about the sun each year. The reason for the seasons is that the axis of earth's rotation is tilted with respect to the plane of its orbit. This tilt is called obliquity of Earth's axis is 23.5 degrees from a line drawn perpendicular to the plane of Earth's orbit. This varies the area and the angle at which the sunlight hits the Earth which in turn varies the amount of energy received in different latitudes. As the earth orbits the sun, there are times of year when the North pole is alternately tilted toward or away from the sun. Summer occurs in the hemisphere tilted toward the sun, when its sunlight strikes Earth at a higher angle. The number of daylight hours is greater for the hemisphere experiencing summer. The hemisphere receiving less radiation or sunlight experiences winter. Arctic circle 60-degree N and Antarctic circle 60-degree S receives less sunlight thus experiencing colder temperatures. The location close to the equator receive more solar energy per unit of surface area annually than locations farther north or south, so these places experience little seasonal variation and remain warm-year round.

What's More

Directions: Describe what would you wear if you are really in these places. Indicate and explain why would you wear such clothes.

1. I am standing outside at 60-degree N latitude, 140-degree W longitude, and it is January. _____
2. I am standing outside at 10-degree N latitude, 0-degree longitude, and it is February. _____
3. I am standing outside at 35-degree N latitude, 60-degree W longitude, and it is July. _____
4. I am standing outside at 40-degree S latitude, 140-degree E longitude, and it is August. _____

RUBRICS

Criteria	**10pts.**	**7pts.**	**5pts.**
Accuracy of Content	The facts are clear, concise and presented well.	The facts are clear with supporting documents.	The facts are lacking.
Presentation of output	The output is original and presented in unique and interesting way.	The presentation shows an attempt of originality.	The presentation is copied.
Creativity and cleanliness	The work is very creative and clean.	The work is somewhat creative but clean.	The work is not creatively done and not clean.

What I Have Learned

Directions: Read and identify the correct word inside the box that fit in the given sentences in the box below. Write your answer on a separate sheet of paper.

Equator	Namibia	Antarctic Circle	Summer
South Pole	Tropic of Cancer	Arctic Circle	Winter
South America	Tropic of Capricorn	Earth	North Pole
Latitude	Vertical Lines	Horizontal lines	

_____1. Its shape is an oblate spheroid.

_____2. It is an important reference point for navigation and geography.

_____3. These lines on a globe runs from east to west.

_____4. This area experiences summer ~~is~~ from October to February during this time, the sun is almost always in the sky.

_____5. It is the pole found in the globe that receives less solar energy around June.

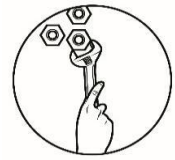
_____6. This is the parallel of latitude that runs 66.56083 degrees north to the Equator.

_____7. It is the southernmost latitude where the sun can be seen directly overhead at noon.

_____8. This circle of latitude contains the sub-solar point at the December solstice.

_____9. The hemisphere receives less sunlight experiences_____.

_____10. The hemisphere receives more sunlight experiences_____.



What I Can Do

Let us test your familiarity with our lesson by simply answering our activity below.

Directions: Make a brief summary of the following lines of latitude and its relationship to the amount of energy received in the area.

LINES OF LATITUDE	DESCRIPTION	AMOUNT OF ENERGY IT RECEIVED
1. EQUATOR	**IT IS AN IMAGINARY LINE AROUND THE MIDDLE OF THE PLANET**	**IT RECEIVED LARGE AMOUNT OF ENERGY BECAUSE IT RECEIVES DIRECT SUNLIGHT IN A SMALLER AREA.**
2.		
3.		
4.		
5.		

RUBRICS

Criteria	10pts.	7pts.	5pts.
Accuracy of Content	The facts are clearly, concise and presented well.	The facts are clear with supporting documents.	The facts are lacking.
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Creativity and cleanliness	The work is very creative and clean.	The work is somewhat creative but clean.	The work is not creatively done and not clean.

Assessment

Directions: Read each item carefully. Write only the letter of the correct answer for each question. Use a separate sheet for your answers.

1. How many parts does the equator divide the earth into?
   A. 2
   B. 4
   C. 6
   D. 8

2. Describe the amount of sunlight received at latitude 60^0N of Arctic.
   A. At this latitude, the amount of sunlight received is high because it is distributed in a smaller area
   B. At this latitude, the amount of sunlight received is high because it is distributed in a larger area
   C. At this latitude, the amount of sunlight received is low because it is distributed in a smaller area
   D. At this latitude, the amount of sunlight received is low because it is distributed in a larger area

3. Describe the amount of sunlight received at the Equator.
   A. At this latitude, the amount of sunlight received is high because it is distributed in a smaller area
   B. At this latitude, the amount of sunlight received is high because it is distributed in a larger area
   C. At this latitude, the amount of sunlight received is low because it is distributed in a smaller area
   D. At this latitude, the amount of sunlight received is low because it is distributed in a larger area

4. At the equatorial region the sunlight is mostly directly overhead. What seasons can the countries located here have?
   A. Autumn
   B. Winter
   C. Summer only
   D. Wet and dry season

5. Which of the following statement correctly describe Tropic of Cancer?
   A. It is an imaginary line, at angle 23.5 degrees South from the equator
   B. Is an imaginary line, at an angle of 23.5-degree North from the equator.
   C. Is an imaginary line, at an angle of 66.5-degree South from the equator
   D. Is an imaginary line at an angle of 668.5-degree North from the equator

6. The North pole and South pole is at 60^0 North and South it is receives ___amount of sunlight?
   A. less
   B. more
   C. moderate
   D. None

7. Describe the amount of sunlight received at latitude 60^0S of Antarctic Circle.
   A. At this latitude, the amount of sunlight received is high because it is distributed in a smaller area
   B. At this latitude, the amount of sunlight received is high because it is distributed in a larger area
   C. At this latitude, the amount of sunlight received is low because it is distributed in a smaller area
   D. At this latitude, the amount of sunlight received is low because it is distributed in a larger area

8. Which of the following statements**,** CORRECTLY describe Arctic Circle?

I. the arctic circle passes through Bahamas II. the arctic circle passes through Northern America III. the arctic circle has two seasons, summer and winter IV. the arctic circle is the parallel of latitude that runs 66.5 degree north to the equator

A. I and II only
B. I, and III only
C. II, III and IV only
D. I, II, III, IV

9. Which of the following statements, CORRECTLY describes Antarctic circle?

I. It is a line of latitude that runs 66.5-degree north to the equator II. It is a line of latitude that runs 66.5-degree south to the equator III. The Antarctic circle summer is from October to February. IV. The winter in Antarctica is during April to October.

A. I and II only
B. I, II, and III
C. II, III and IV
D. I, II, III, IV

10. Which of the following statements, is correct?

A. the tilt of the earth cause season.
B. the axis of the earth cause season
C. the rotation of the earth cause season
D. It the revolution of the earth cause season

Additional Activities

THINK, MAKE AND SHARE
Make a short poem about the relationship of latitude with amount of energy received.

RUBRICS

Criteria	**10pts.**	**7pts.**	**5pts.**
Accuracy of Content	The facts are clearly, concise and presented well.	The facts are clear with supporting documents.	The facts are lacking.
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Answer Key

What I Know

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

Assessment

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

What's New

1. North Pole
2. Arctic circle
3. Tropic of Cancer
4. Tropic of Capricorn
5. Antarctic Circle

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