

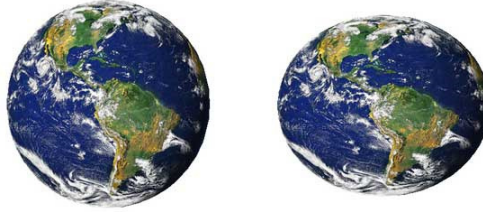
## EARTH DIMENSIONS

AIM 1: What is the shape of earth?

HW from "Reviewing Earth Science, the Physical Setting"

- Read "The Shape of Earth" p12-14
- Do all questions on Part A&B-1 p14&15
- Read "Locating Positions on Earth" p15-18
- Do all questions on Part A p18-20

Earth is not a perfect sphere it is actually an oblate spheroid slightly flattened at the poles.



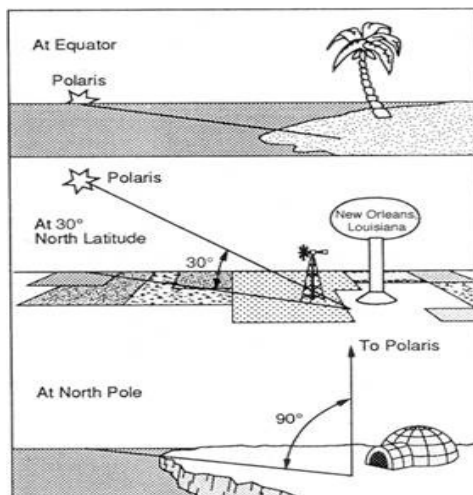
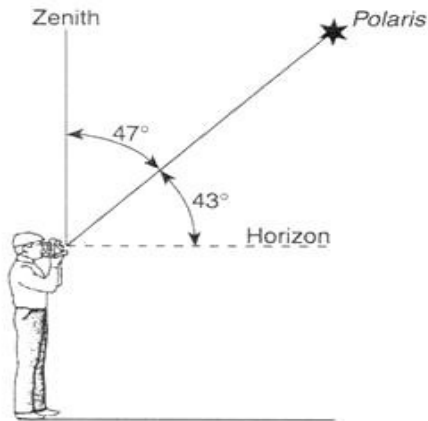
NO

YES

An astrolabe is an instrument used to measure the altitude of celestial bodies such as stars.

The altitude of a celestial body is its angular height above the horizon of an observer.

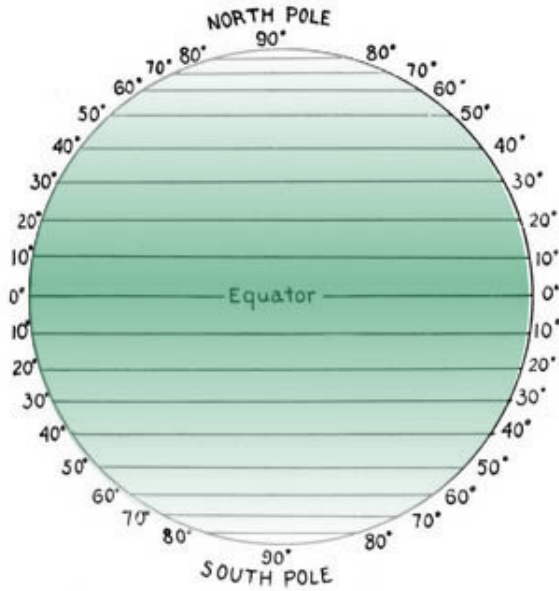
Ex: On the diagram below the altitude of Polaris is  $43^\circ$



Every position on Earth is assigned a pair of coordinates called latitude and longitude with two main reference lines, the equator and the prime meridian.

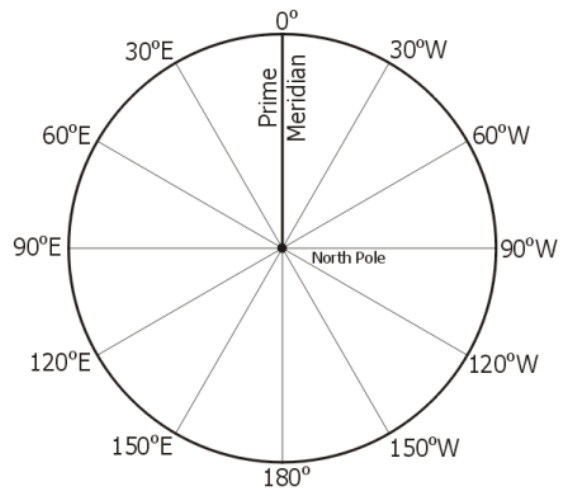
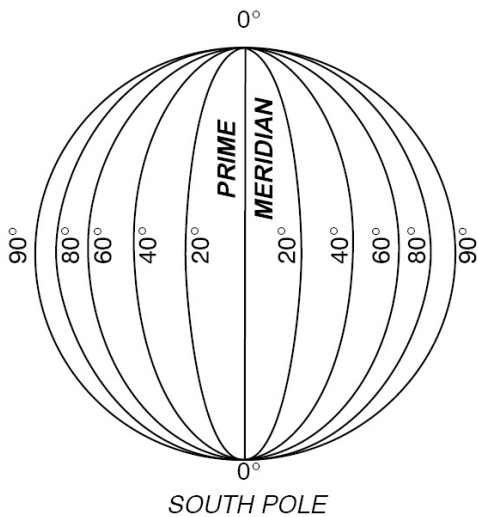
A latitude or parallel is an imaginary line drawn around Earth, parallel to the equator.

The equator (Latitude  $0^\circ$ ) is the line dividing the Northern and the Southern hemispheres.



A longitude is a line drawn from the two poles.

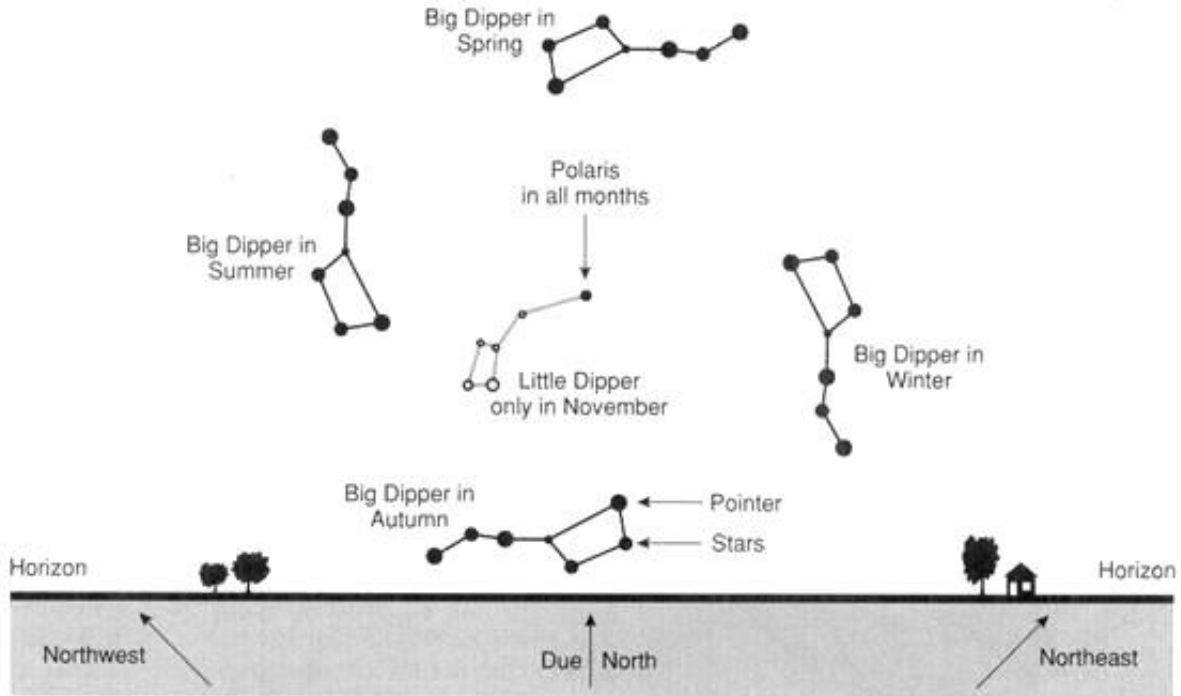
The prime meridian (longitude  $0^\circ$ ) is the line that runs through Greenwich, England, from the North Pole to the South Pole.



Navigation is the science of locating your position on Earth.

Latitude in the Northern hemisphere is calculated the following way

1. From your location find the big dipper in the northern sky.



2. Connect the two stars (the pointer stars) at the end of the bowl of the big dipper and extend the line until you reach Polaris, a very bright star.
3. Take the altitude of Polaris using an astrolabe. The altitude of Polaris is your northern latitude.

Ex: The altitude of Polaris at New York City is  $40^\circ$  therefore New York City's latitude is  $40^\circ\text{N}$ .

Longitude in the Northern hemisphere is calculated the following way

1. Find the time at your location.
2. Find the time at the prime meridian (Greenwich Time)
3. Calculate the time difference, in hours, between the time at your location and Greenwich Time.
4. Your longitude will then be the time difference multiplied by 15 degree/hour, because Earth rotates 15 degree/hour from west to east.

If the time at your location is earlier than Greenwich Time your position is west of the prime meridian.

If the time at your location is later than Greenwich Time your position is east of the prime meridian.

Ex: What is the longitude of your location if local time is 2 pm and Greenwich Time is 7 pm?

1. Local time is 2 pm
2. Greenwich Time is 7 pm.
3. The difference is 5 hours
4.  $5 \text{ hours} \times 15 \text{ degree/hours} = 75 \text{ degree}$
5. Since local time is earlier than Greenwich Time the longitude is  $75^\circ\text{W}$

Earth is divided into three main spheres.

The lithosphere includes the crust and the rigid mantle,  
See RT page 10 for actual location. See RT page 11 for its chemical composition.

The hydrosphere consists of all bodies of water in and on the ground. See RT page 11 for chemical composition.

The troposphere is the layer of the atmosphere in contact with Earth. See RT page 11 for its chemical composition and RT page 14 for additional information.

Test your understanding

8/07

4 Approximately how many degrees per day does Earth revolve in its orbit around the Sun?

- (1) 1° (2) 13° (3) 15° (4) 23.5°

13 The approximate latitude of Utica, New York, is

- (1) 43°05' N (2) 43°05' S (3) 75°15' E (4) 75°15' W

Base your answers to questions 38 and 39 on the isoline map below, which shows the average yearly precipitation, in inches, across New York State.



38 Which New York State landscape region receives the greatest average yearly precipitation?

- (1) Catskills (2) Tug Hill Plateau (3) Adirondack Mountains (4) Taconic Mountains

39 Approximately how many inches of average yearly precipitation does Rochester, New York, receive?

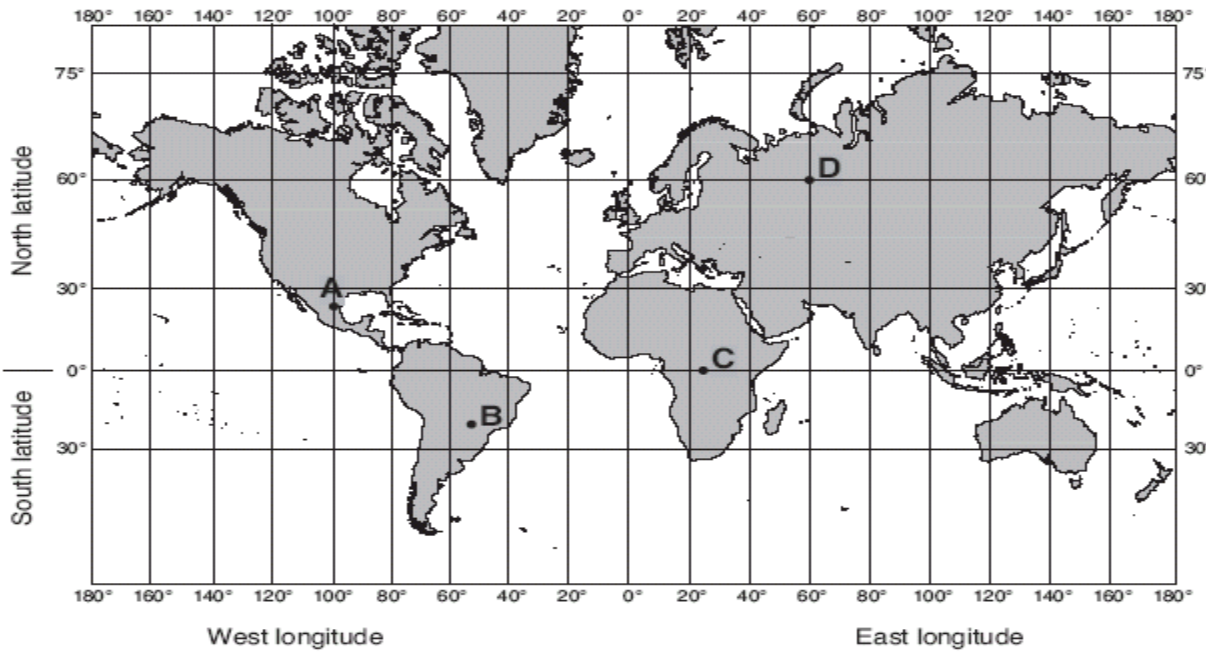
- (1) 26 (2) 30 (3) 38 (4) 42

6/07

12 The two elements that make up the largest percentage by mass of Earth's crust are oxygen and

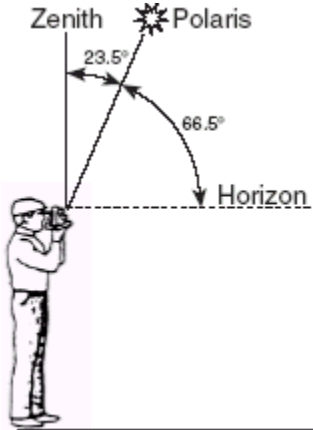
- (1) silicon (2) potassium (3) hydrogen (4) nitrogen

36 At which location could an observer *not* see *Polaris* in the night sky at any time during the year? (1) A (2) B (3) C (4) D



6/06

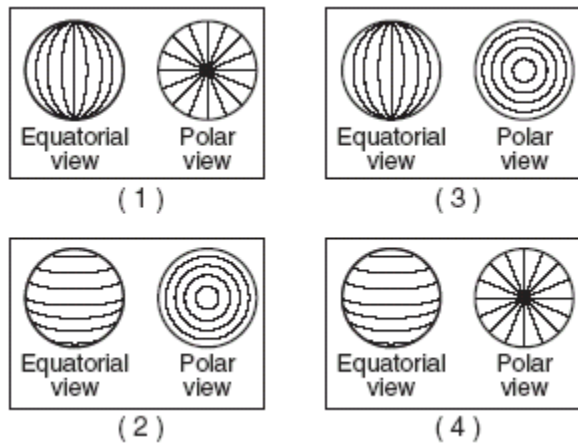
What is the latitude of this observer?



- (1) 90° N (2) 66.5° N (3) 43° N (4) 23.5° N

1/06

4 The lines on which set of views best represent Earth's latitude system?



6 At which New York State location will an observer most likely measure the altitude of *Polaris* as approximately 42°?

- (1) Jamestown (2) Plattsburgh (3) Oswego (4) New York City

1/05

11 What is the approximate location of the Canary Islands hot spot?

- (1) 32° S 18° W (2) 32° S 18° E (3) 32° N 18° W (4) 32° N 18° E

8/04

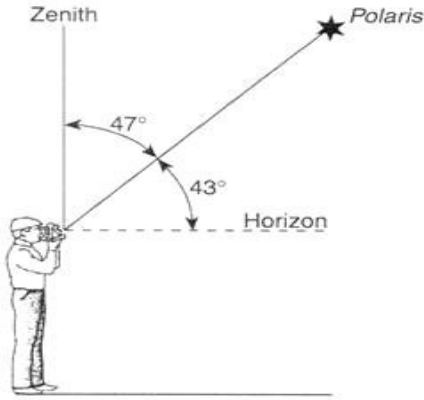
10 As a ship crosses the Prime Meridian, an observer on the ship measures the altitude of Polaris at  $60^\circ$ .

What is the ship's location?

- (1)  $60^\circ$  south latitude and  $0^\circ$  longitude
- (2)  $60^\circ$  north latitude and  $0^\circ$  longitude
- (3)  $0^\circ$  latitude and  $60^\circ$  east longitude
- (4)  $0^\circ$  latitude and  $60^\circ$  west longitude

2003-8

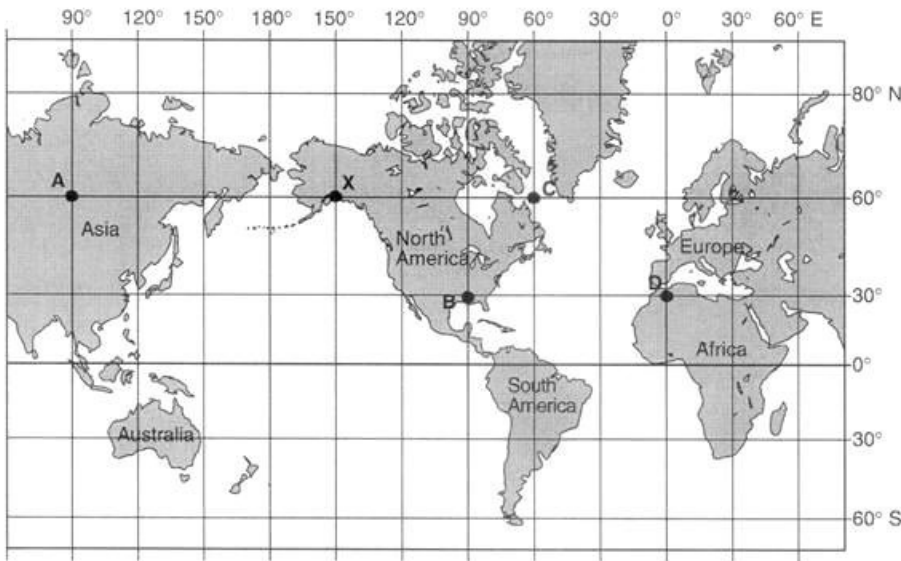
3 The diagram below shows an observer on Earth measuring the altitude of Polaris.



What is the latitude of this observer?

- (1)  $43^\circ$  N
- (2)  $43^\circ$  S
- (3)  $47^\circ$  N
- (4)  $47^\circ$  S

8 Letters A, B, C, D, and X on the map below represent locations on Earth. The map shows the latitude-longitude grid.

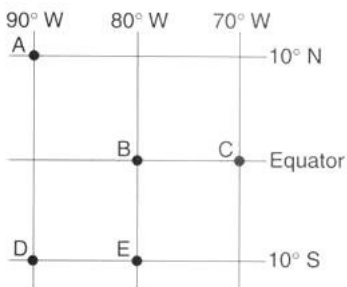


Solar time is based on the position of the Sun. If the solar time at location X is 11 am, at which location is the solar time 5 p.m.?

- (1) A
- (2) B
- (3) C
- (4) D

2003-6

Base your answers to questions 39 and 40 on the map below, which shows the latitude and longitude of five observers, A, B, C, D, and E, on Earth.



39 What is the altitude of Polaris (the North Star) above the northern horizon for observer A?

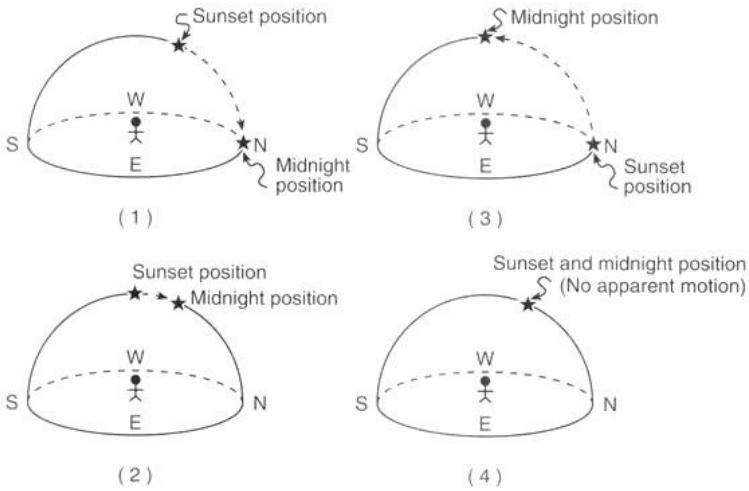
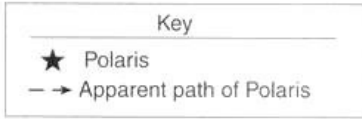
- (1)  $0^\circ$
- (2)  $10^\circ$
- (3)  $80^\circ$
- (4)  $90^\circ$

40 Which two observers would be experiencing the same apparent solar time?

- (1) A and C
- (2) B and C
- (3) B and E
- (4) D and E

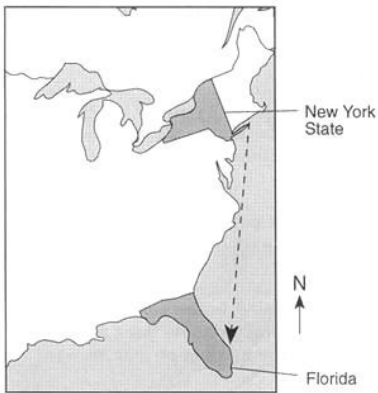
2003-1

1. Which diagram correctly shows the apparent motion of Polaris from sunset to midnight for an observer in northern Canada?



2002-6

1 The dashed line on the map below shows a ship's route from long Island, New York, to Florida. As the ship travels south, the star Polaris appears lower in the northern sky each night.



14 When the time of day for a certain ship at sea is 12 noon, the time of day at the Prime Meridian (0° longitude) is 5 p.m. What is the ship's longitude?

- (1) 45 °W (2) 45 °E (3) 75 °W (4) 75 °E

2002-1

7 At which location will the highest altitude of the star Polaris be observed?

- (1) Equator (2) Tropic of Cancer (3) Arctic Circle (4) central New York State

2001-8

3 The length of an Earth day is determined by the time required for approximately one

- (1) Earth rotation (2) Earth revolution (3) Sun rotation (4) Sun revolution

4 To an observer in Buffalo, New York, the North Star, Polaris, is always located above the northern horizon at an altitude of approximately

- (1) 23 ½° (2) 43° (3) 66 ½° (4) 90°

2001-6

6 The length of an Earth year is based on Earth's

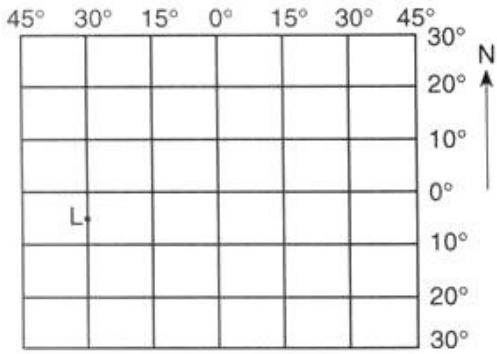
- (1) rotation of 15°/hr (2) revolution of 15°/hr (3) rotation of approximately 1°/day (4) revolution of approximately 1°/day

9 The diagram below shows the latitude-longitude grid on an Earth model. Points A and B are locations on the surface.



On Earth, the solar time difference between point A and point B would be  
 (1) 1 hour (2) 5 hours (3) 12 hours (4) 24 hours

10 The diagram below represents part of Earth's latitude-longitude system.



What is the latitude and longitude of point L?

- (1) 5° E 30° N (2) 5° W 30° S (3) 50° N 30° E (4) 5° S 30° W