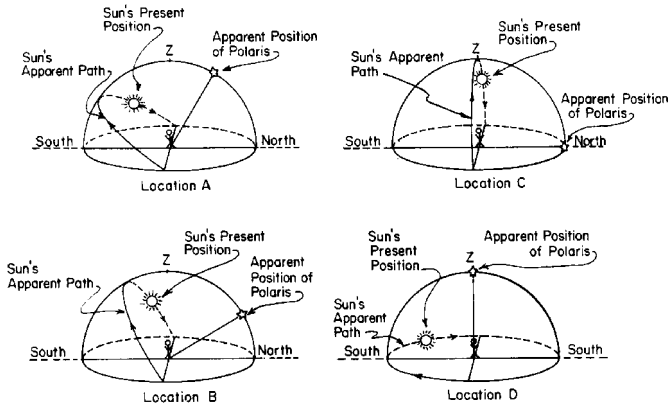
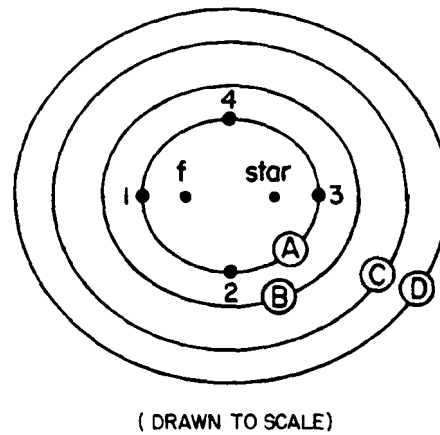


Base your answers to questions 1 through 5 on the diagrams below. The diagrams represent four locations on the Earth's surface at the same time on March 21. Lines have been drawn to represent the apparent path of the Sun across the sky. The present position of the Sun, the position of Polaris, and the zenith (Z) are shown for an observer at each location.



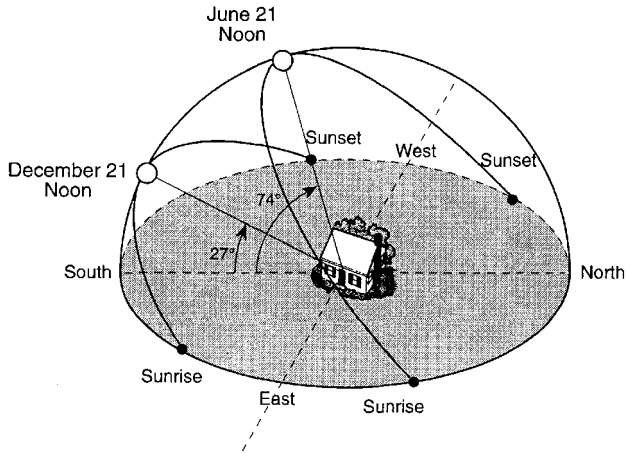
- To an observer at location *A*, the Sun will appear to move from
 - east to west at 15°/hr
 - west to east at 15°/hr
 - east to west at 1°/hr
 - west to east at 1°/hr
- The Sun's apparent path through the sky on this day is a direct result of the
 - Sun's rotation
 - Earth's rotation
 - Sun's revolution around the Earth
 - Earth's revolution around the Sun
- At which location is the angle of insolation greatest at solar noon?
 - A*
 - B*
 - C*
 - D*
- What is the latitude of the observer at location *D*?
 - 90° N
 - 66½° N
 - 23½° N
 - 0°
- What time of day is shown by the Sun's present position at location *A*?
 - morning
 - noon
 - afternoon
 - midnight
- The elliptical shape of the Earth's orbit results in
 - changes in the orbital velocity of the Earth
 - tilting of the Earth's axis
 - the oblate spheroid shape of the Earth
 - the phases of the Moon

Base your answers to questions 7 through 10 on your knowledge of Earth science, the *Earth Science Reference Tables*, and the diagram below. The diagram represents four planets, *A*, *B*, *C*, and *D*, traveling in elliptical orbits around a star. The center of the star and letter *f* represent the foci for the orbit of planet *A*. Points 1 through 4 are locations on the orbit of planet *A*.



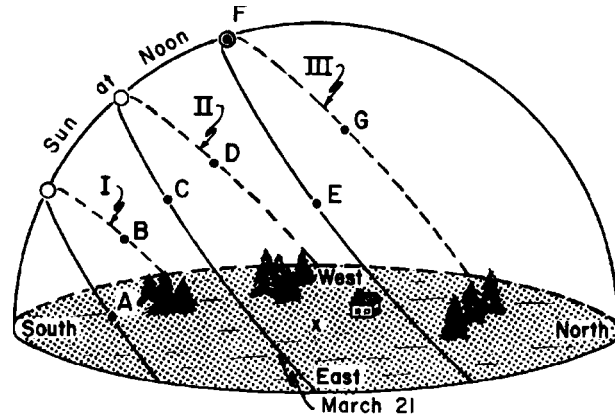
- Which is the order of the planets from shortest period of revolution to longest?
 - A*, *B*, *C*, *D*
 - B*, *A*, *D*, *C*
 - C*, *D*, *A*, *B*
 - D*, *C*, *B*, *A*
- If planets *A*, *B*, *C*, and *D* have the same mass and are located at the positions shown in the diagram, the planet that has the greatest gravitational attraction to the star is
 - A*
 - B*
 - C*
 - D*
- Planet *A* travels fastest in its orbit at location
 - 1
 - 2
 - 3
 - 4
- Using the equation and metric ruler in the *Earth Science Reference Tables*, the eccentricity of planet *A*'s orbit is found to be approximately
 - 0.10
 - 0.20
 - 0.50
 - 5.0
- Because Venus has greater atmospheric carbon dioxide (CO₂) content than Earth has, the surface temperature of Venus is
 - warmer, due to absorption of long-wave (infrared) radiation by a greenhouse gas
 - warmer, due to absorption of short-wave (ultraviolet) radiation by a greenhouse gas
 - cooler, due to absorption of long-wave (infrared) radiation by a greenhouse gas
 - cooler, due to absorption of short-wave (ultraviolet) radiation by a greenhouse gas

Base your answers to questions 12 through 14 on the *Earth Science Reference Tables* and the diagram below. The diagram represents the Sun's apparent path in relation to a house on June 21 and on December 21.



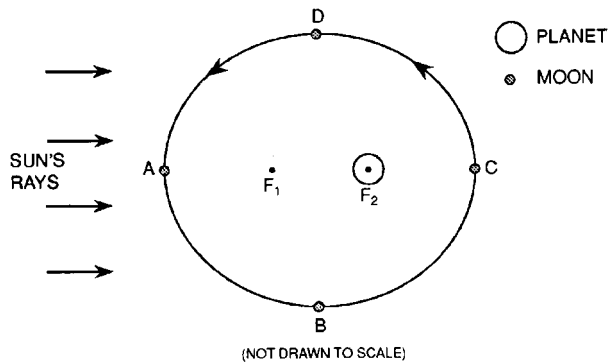
12. What is the most likely location of the house shown in the diagram?
- (1) Australia (3) South America
 (2) North Pole (4) North America
13. For the roof of this house, which color would absorb the most insolation and also reradiate the most energy?
- (1) white (3) grey
 (2) green (4) black
14. Which factor is a cause of the difference in the noontime altitude of the Sun on June 21 and December 21?
- (1) the tilt of Earth's axis
 (2) the Sun's apparent diameter
 (3) Earth's changing distance from the Sun
 (4) the Sun's period of rotation
-
15. Compared to Jupiter and Saturn, Venus and Mars have greater
- (1) periods of revolution
 (2) orbital velocities
 (3) mean distances from the Sun
 (4) equatorial diameters

Base your answers to questions 16 through 20 on your knowledge of Earth science and the diagram below. The diagram represents the apparent path of the Sun at three different dates during the year as it appears to an observer in New York State. The paths are labeled I, II, III and letters A through G are points on the paths. Path II occurs on March 21.



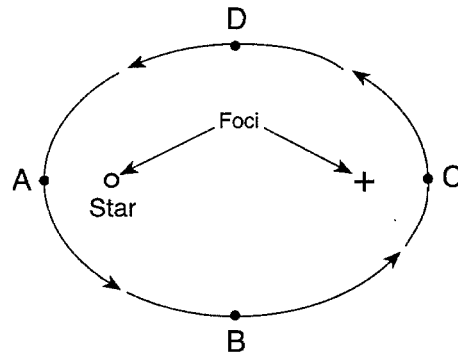
16. Which statement explains the apparent daily motion of the Sun across the sky along path II?
- (1) The Earth rotates on its axis.
 (2) The Earth revolves around the Sun.
 (3) The Earth's axis is inclined to its orbit.
 (4) The Earth's orbit is elliptical.
17. The angular distance along path II between points C and D is measured to be 90. Approximately how much time would be required for the Sun to move this distance?
- (1) 1 hour (3) 6 hours
 (2) 2 hours (4) 4 hours
18. What would be the position of the Sun at 3 p.m. in December?
- (1) A (3) E
 (2) B (4) G
19. Which would be the approximate length of the daylight period for the observer when the Sun travels along the entire length of path I?
- (1) 9 hours (3) 15 hours
 (2) 12 hours (4) 18 hours
20. The Sun is at point F, which is the maximum altitude of the Sun for the year. A vertical stick is placed at location X, and the stick's shadow is measured each noon for the next 30 days. During this time, the length of the shadow will
- (1) become shorter (3) remain the same
 (2) become longer
-

Base your answers to questions 21 through 25 on the *Earth Science Reference Tables* and the diagram below. The diagram represents a model of the orbit of a moon around a planet. Points *A*, *B*, *C*, and *D* indicate four positions of the moon in its orbit. Points F_1 and F_2 are focal points of the orbit.



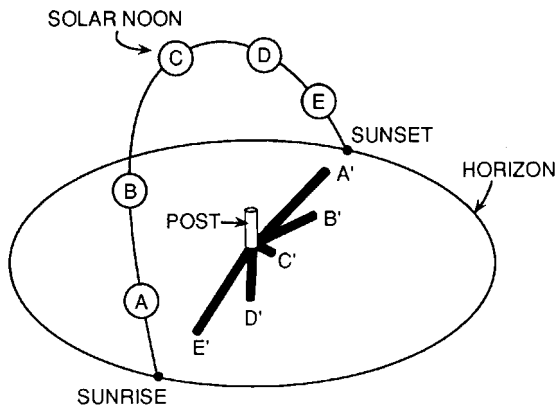
21. If the moon takes 6.8 days to move from point *A* to point *B*, the best estimate of the time required for one complete revolution is
- (1) 20. days (3) 34 days
 (2) 27 days (4) 41 days
22. When viewed from the planet, the moon has the greatest apparent diameter at point
- (1) *A* (3) *C*
 (2) *B* (4) *D*
23. If the distance from F_1 to F_2 is 42,000 kilometers and the distance from *A* to *C* is 768,000 kilometers, what is the eccentricity of the moon's orbit?
- (1) 0.055 (3) 0.81
 (2) 0.18 (4) 0.94
24. For an observer on the planet, at which position in the moon's orbit does the full-moon phase occur?
- (1) *A* (3) *C*
 (2) *B* (4) *D*
25. As the moon moves in its orbit from point *D* to point *B*, the force of gravitational attraction between the moon and the planet
- (1) increases, only (3) increases, then decreases
 (2) decreases, only (4) decreases, then increases
-
26. Base your answer to the following question on the *Earth Science Reference Tables*.
- Which of the following stars is hottest?
- (1) a red giant (3) the sun
 (2) a white dwarf (4) a red dwarf

Base your answers to questions 27 and 28 on the diagram below, which represents the path of a planet in an elliptical orbit around a star. Points *A*, *B*, *C*, and *D* indicate four orbital positions of the planet.



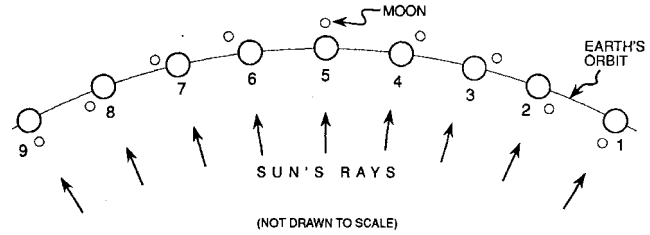
27. The eccentricity of the planet's orbit is approximately
- (1) 0.18 (3) 1.55
 (2) 0.65 (4) 5.64
28. Which graph best represents the gravitational attraction between the star and the planet?
- (1) (3)
- (2) (4)
-
29. The new-moon phase occurs when the Moon is positioned between the Earth and the Sun. However, these positions do not always cause an eclipse (blocking) of the Sun because the
- (1) Moon's orbit is tilted relative to the Earth's orbit
 (2) new-moon phase is visible only at night
 (3) night side of the Moon faces toward the Earth
 (4) apparent diameter of the Moon is greatest during the new-moon phase


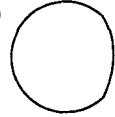

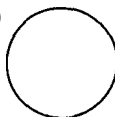
Base your answers to questions 30 through 34 on the *Earth Science Reference Tables* and the diagram below. The diagram shows a post located in the Northern Hemisphere. Five different shadows, A' , B' , C' , D' , and E' , are cast on a certain day by the post when the Sun is in positions A , B , C , D , and E , respectively.



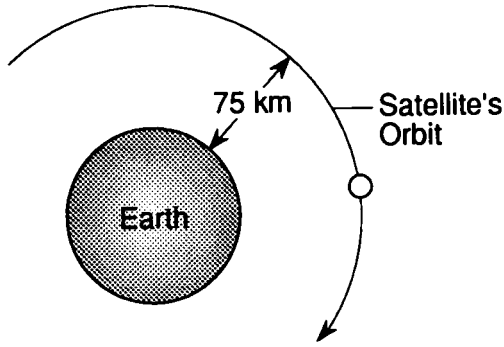
30. Which motion causes the apparent daily path of the Sun shown in the diagram?
- (1) the Sun's revolution (3) the Earth's revolution
 (2) the Sun's rotation (4) the Earth's rotation
31. In the Northern Hemisphere, the intensity of insolation during the year is greatest when
- (1) shadow A' is longest (3) shadow C' is shortest
 (2) shadow D' is longest (4) shadow E' is shortest
32. What would be the approximate duration of insolation for this location when shadow C' reaches its greatest length during the year?
- (1) 10 hours (3) 15 hours
 (2) 12 hours (4) 24 hours
33. From September 23 to December 20, the length of the shadow at noon will
- (1) decrease (3) remain the same
 (2) increase
34. Which statement would be true if this post were located at the Equator on March 21?
- (1) There would be no shadows at sunrise or sunset.
 (2) There would be no shadow at solar noon.
 (3) Shadow C' would point north at solar noon.
 (4) Shadow C' would point south at solar noon.

Base your answers to questions 35 through 39 on the diagram below. The diagram represents nine positions of the Earth in orbit around the Sun during one complete orbit of the Moon around the Earth.



35. Which phase of the Moon will be seen from the Earth at position 5?
- (1)  (3) 
 (2)  (4) 
36. The elliptical shape of the Moon's orbit around the Earth causes
- (1) changes in the gravitational attraction between the Moon and the Earth
 (2) the Earth to have an equatorial bulge
 (3) the Moon's period of rotation to equal its period of revolution
 (4) the $23\frac{1}{2}^\circ$ tilt of the Earth's axis of rotation
37. At which position might the Moon block part of the Sun, making a solar eclipse visible from Earth?
38. During the time that the Earth travels from position 1 to position 9, an observer on the Earth will see the lighted portion of the Moon
- (1) decrease, only (3) decrease, then increase
 (2) increase, only (4) increase, then decrease
39. The Earth rotates on its axis, causing the Moon to appear to rise each day. Moonrise occurs about 52 minutes later each day because as the Earth completes one rotation, the Moon also
- (1) completes one rotation on its axis
 (2) wobbles on its axis
 (3) is inclined $23\frac{1}{2}^\circ$
 (4) revolves part way around the Earth

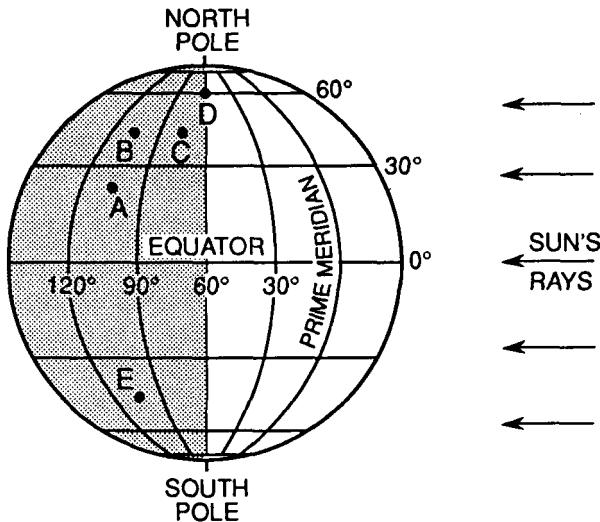
Base your answers to questions 40 and 41 on the diagram below which shows part of the orbit of a satellite around the Earth. The distance from the satellite's orbit to the Earth's surface is 75 kilometers.



(Not drawn to scale)

40. According to the *Earth Science Reference Tables*, in which portion of the Earth's atmosphere is the satellite located?
- | | |
|------------------|------------------|
| (1) troposphere | (3) mesosphere |
| (2) stratosphere | (4) thermosphere |
41. Which force is most directly responsible for keeping the satellite in orbit around the Earth?
- | | |
|--------------|---------------|
| (1) friction | (3) magnetism |
| (2) gravity | (4) Coriolis |

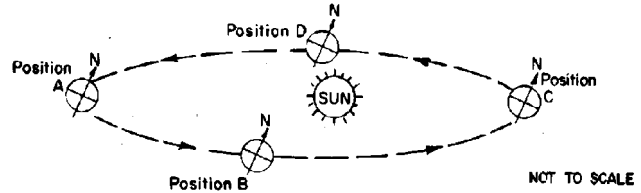
Base your answers to questions 42 through 44 on the *Earth Science Reference Tables* and the diagram of the Earth below. Some of the latitude and longitude lines have been labeled. Points *A* through *E* represent locations on the Earth's surface.



42. What do locations *A*, *B*, and *E* have in common?
- | |
|---|
| (1) They are in the same season. |
| (2) They have the same local time. |
| (3) They have the same prevailing wind direction. |
| (4) They are at the same latitude. |

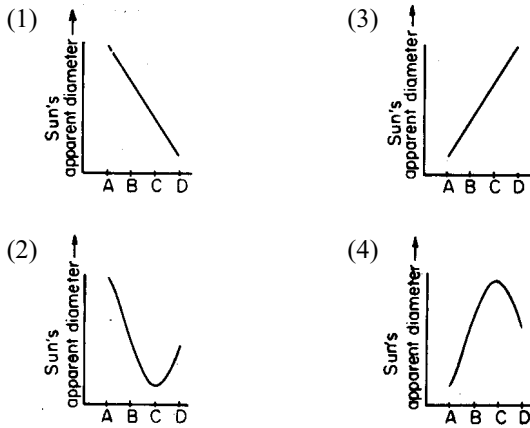
43. What is the approximate time at location *D*?
- | | |
|------------|--------------|
| (1) 6 a.m. | (3) 6 p.m. |
| (2) noon | (4) midnight |
44. As a traveler goes from location *A* to location *B*, the altitude of Polaris will
- | | |
|--------------|---------------------|
| (1) decrease | (3) remain the same |
| (2) increase | |

Base your answers to questions 45 through 49 on the diagram below which shows four positions of the Earth in its orbit around the Sun. The diagram indicates relative positions of the Earth to the Sun, but the diagram has *not* been drawn to scale.



45. When the Earth is at position *A*, where will the Sun appear to rise anywhere in New York State?
- | | |
|-----------------------|-----------------------|
| (1) due west | (3) due east |
| (2) north of due east | (4) south of due east |
46. In which position would New York State receive the maximum insolation?
- | | |
|--------------|--------------|
| (1) <i>A</i> | (3) <i>C</i> |
| (2) <i>B</i> | (4) <i>D</i> |
47. As the Earth moves from position *B* to position *C*, its orbital velocity will
- | | |
|--------------|---------------------|
| (1) decrease | (3) remain the same |
| (2) increase | |
48. For an observer in New York State, which event will occur when the Earth is at position *C*?
- | |
|--|
| (1) maximum altitude of the Sun |
| (2) maximum intensity of insolation |
| (3) minimum apparent diameter of the Sun |
| (4) minimum duration of insolation |

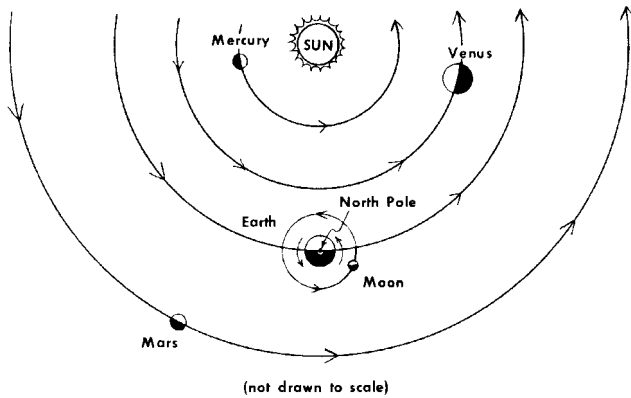
49. Which graph best represents the relationship between the Sun's apparent diameter and the positions of the Earth around the Sun from *A* to *D*?



50. Which planet has the most eccentric orbit?

- (1) Mercury
- (2) Venus
- (3) Neptune
- (4) Pluto

Base your answers to questions 51 through 55 on your knowledge of Earth science, the *Earth Science Reference Tables*, and the diagram below which shows part of the orbital paths of some of the planets of the solar system.



51. What is the true shape of each planet's actual orbit around the Sun?

- (1) perfectly circular
- (2) nearly spherical
- (3) slightly elliptical
- (4) very eccentric

52. Which of the planets shown requires the longest time for one revolution around the Sun?

- (1) Mercury
- (2) Venus
- (3) Earth
- (4) Mars

53. All of the planets and the Moon have approximately the same plane of orbit as on this sheet of paper. At midnight in New York State, an observer would never be able to see

- (1) Mercury
- (2) Polaris
- (3) Mars
- (4) the Moon

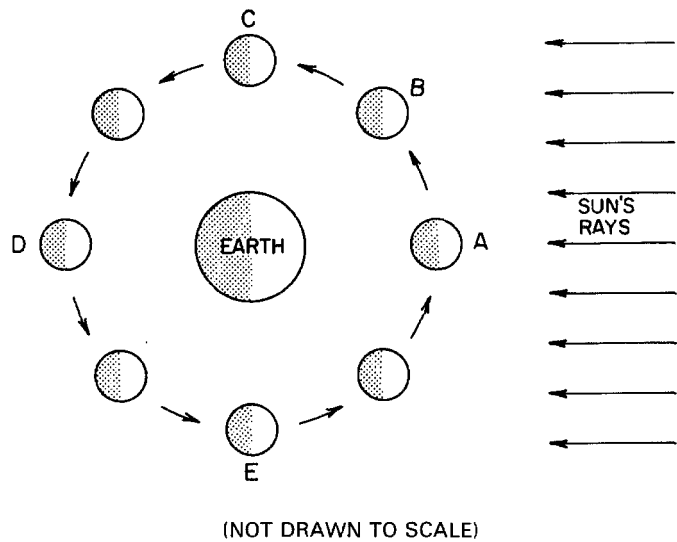
54. The Moon's gravitational force has a greater tide causing effect on bodies of water on the Earth than the Sun's gravitational force. What is one reason for this?

- (1) The Moon's mass is greater than the Sun's mass.
- (2) The Moon is closer to the Earth than the Sun is.
- (3) The Moon's mass is less than the Sun's mass.
- (4) The Moon's gravitational force always attracts while the Sun's sometimes repels.

55. An observer on the Earth records the motion of Mars for three hours, starting at sunset when Mars and Earth are in the position shown in the diagram. Mars would appear to

- (1) move toward the western horizon
- (2) move toward the eastern horizon
- (3) remain fixed in the same position

Base your answers to questions 56 through 59 on the *Earth Science Reference Tables* and the diagram below. The diagram represents the Moon in various positions in its orbit around the Earth. Letters *A* through *E* represent five of the Moon's positions.



56. Which diagram best represents the appearance of the Moon to an observer on the Earth when the Moon is at position *B*?

- (1)
- (2)
- (3)
- (4)

57. The Moon would *not* be visible from Earth when the Moon is at position

- (1) *A* (3) *C*
 (2) *E* (4) *D*

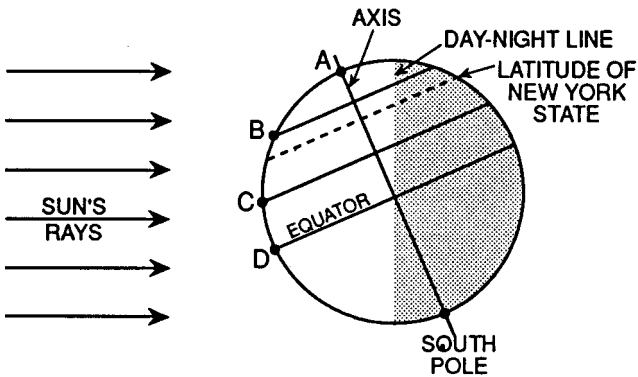
58. Why would an observer on Earth see a complete cycle of phases of the Moon in approximately 1 month?

- (1) The Moon rotates on its axis.
 (2) The Moon revolves around the Earth.
 (3) The Earth rotates on its axis.
 (4) The Earth revolves around the Sun.

59. If the distance of the Moon from the Earth were to increase, the length of time the Moon would take to complete one revolution around the Earth would

- (1) decrease (3) remain the same
 (2) increase

Base your answers to questions 60 and 61 on the diagram below which shows the Earth as viewed from space. The shaded side represents the nighttime side of the Earth.



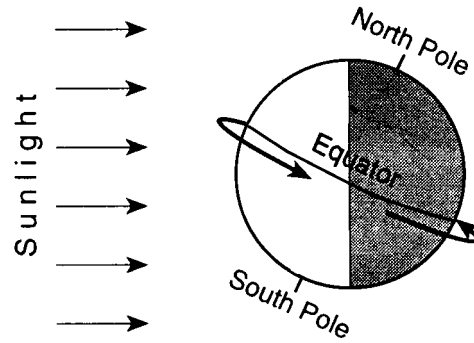
60. Which point on the Earth's surface is receiving the greatest intensity of insolation?

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

61. The total number of hours of daylight received by New York State on the date represented in the diagram is closest to

- (1) 9 hr (3) 15 hr
 (2) 12 hr (4) 20 hr

62. Base your answer to the following question on the diagram below, which shows a view of Earth as seen from space at a certain time of the year.



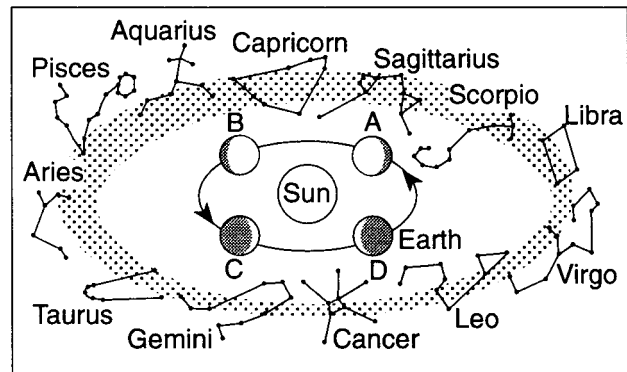
The Earth motion represented by the curved arrows in the diagram produces which observable phenomenon?

- (1) the apparent yearly cyclic changes in the Sun's diameter
 (2) the apparent daily arc of the Sun across the sky
 (3) the monthly change in phases of the Moon
 (4) the yearly change in seasons

63. Which planet's day is longer than its year?

- (1) Mercury (3) Mars
 (2) Venus (4) Jupiter

Base your answers to questions 64 and 65 on the diagram below. The diagram shows twelve constellations that are visible in the night sky to an observer in New York State, over the course of a year. Different positions of Earth are represented by letters A through D. The arrows represent the direction of Earth's motion around the Sun.



(Not drawn to scale)

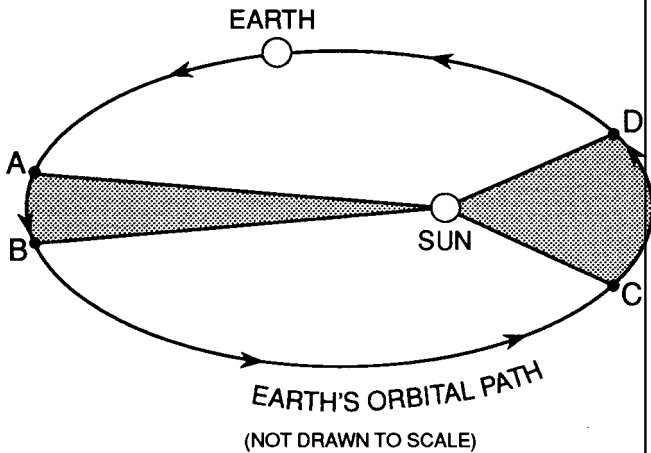
64. The constellations observed from New York State when Earth is at position A are different from the constellations observed when Earth is at position C because

- (1) Earth moves in its orbit
 (2) Earth is tilted on its axis
 (3) the lengths of day and night are different
 (4) the stars move around Earth as shown by star trails

65. Which constellations are both visible at midnight to an observer in New York State when Earth is located at position D?
- (1) Aries and Taurus (3) Leo and Virgo
 (2) Pisces and Libra (4) Aquarius and Scorpio

66. Why are impact structures (craters) more common on the surface of Mars than on the surfaces of Venus, Earth, and Jupiter?
- (1) Mars has the greatest surface area and receives more impacts.
 (2) The tiny moons of Mars are breaking into pieces and showering its surface with rock fragments.
 (3) Mars has a strong magnetic hold that attracts iron-containing rock fragments from space.
 (4) The thin atmosphere of Mars offers little protection against falling rock fragments from space.

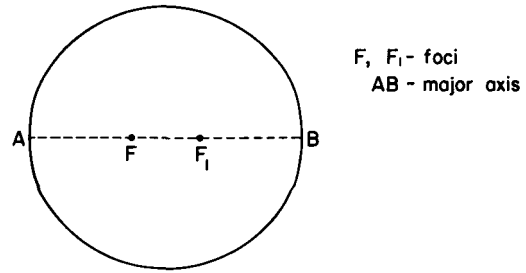
67. The diagram below represents the Earth's orbital path around the Sun. The Earth takes the same amount of time to move from A to B as from C to D.



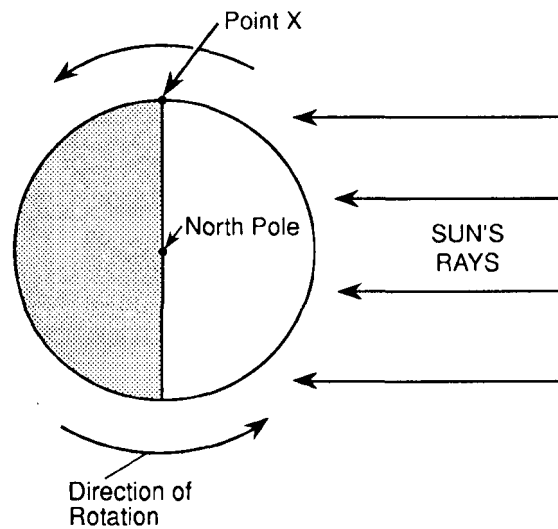
Which values are equal within the system?

- (1) The shaded sections of the diagram are equal in area.
 (2) The distance from the Sun to the Earth is the same at point A and at point D.
 (3) The orbital velocity of the Earth at point A equals its orbital velocity at point C.
 (4) The gravitational force between the Earth and the Sun at point B is the same as the gravitational force at point D.

68. Based on the diagram below and the *Earth Science Reference Tables*, what is the eccentricity of the ellipse shown below?



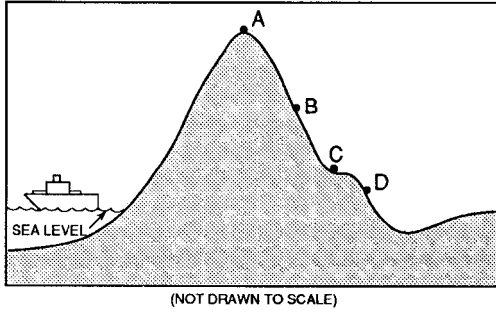
- (1) 1.0 (3) 0.25
 (2) 0.5 (4) 0.13
69. The diagram below shows the rotating Earth as it would appear from a satellite over the North Pole.



The time at point X is closest to

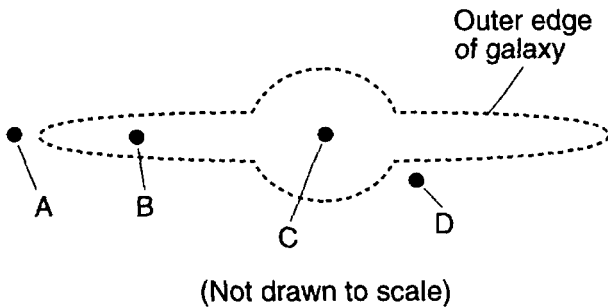
- (1) 6 a.m. (3) 6 p.m.
 (2) 12 noon (4) 12 midnight

70. In the diagram below, letters *A* through *D* represent the locations of four observers on the Earth's surface. Each observer has the same mass.



The gravitational force is strongest between the center of the Earth and the observer at location

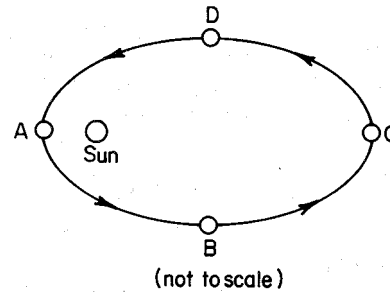
- (1) *A* (2) *B* (3) *C* (4) *D*
71. A person in New York State observes a star that is due east and just above the horizon. During the next hour, the distance between the star and the horizon will appear to
- (1) decrease (2) increase (3) remain the same
72. The diagram below represents a side view of the Milky Way Galaxy.



At approximately which position is Earth's solar system located?

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

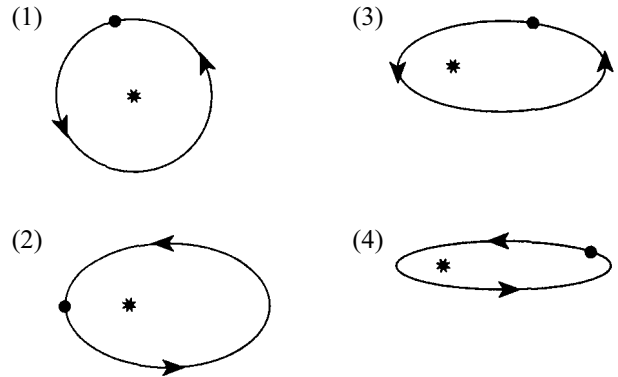
73. The diagram below shows a planet's orbit around the Sun.



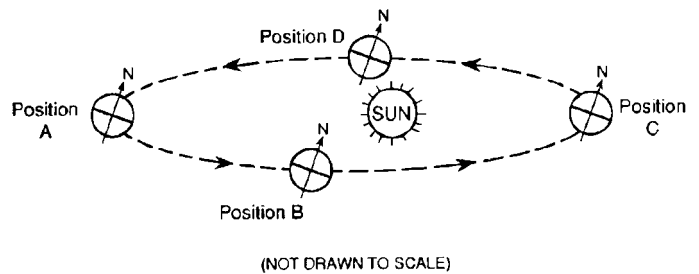
At which location is the planet's orbital velocity greatest?

- (1) *A* (2) *B* (3) *C* (4) *D*
74. Which diagram shows a planet with the *least* eccentric orbit?

(Key: • = planet * = star)



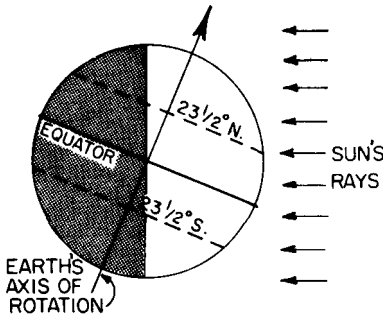
75. The diagram below represents four positions of the Earth as it revolves around the Sun.



At which position is the Earth located on December 21?

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

76. In the diagram below, the direct rays of the Sun are striking the Earth's surface at $23\frac{1}{2}^{\circ}\text{N}$. What is the date shown in the diagram?

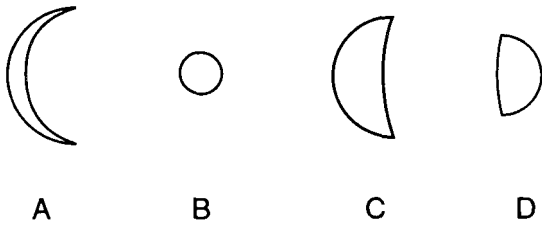


- (1) March 21 (3) September 23
 (2) June 21 (4) December 21

77. New York State has several more hours of daylight in summer than in winter. Which statement helps explain this observation?

- (1) The Earth is tilted on its axis.
 (2) The distance between the Earth and the Sun varies.
 (3) The diameter of the Sun appears to change.
 (4) The speed of the Earth in its orbit changes.

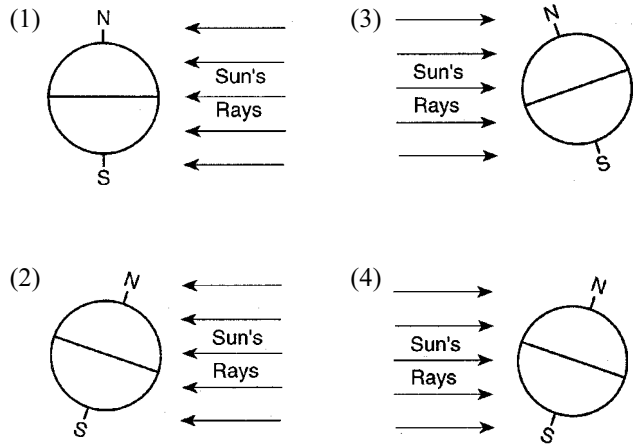
78. The diagrams below represent photographs of Venus at four different positions in its orbit, as taken from Earth.



At which position is Venus closest to Earth?

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

79. Which diagram shows the position of the Earth relative to the Sun's rays during a winter day in the Northern Hemisphere?



80. Based on observations made in the Northern Hemisphere, which statement is the best supporting evidence that the Earth rotates on its axis?

- (1) The stars appear to follow daily circular paths around Polaris.
 (2) The apparent solar diameter varies throughout the year.
 (3) The length of the daylight period varies throughout the year.
 (4) The seasons (spring, summer, fall, and winter) repeat in a cyclic pattern.

81. On December 21, at which latitude would an observer find the Sun directly overhead?

- (1) 0° (3) $23\frac{1}{2}^{\circ}$ South
 (2) $23\frac{1}{2}^{\circ}$ North (4) 90° South

82. If the distance between the Earth and the Sun were increased, which change would occur?

- (1) The apparent diameter of the Sun would decrease.
 (2) The amount of insolation received by the Earth would increase.
 (3) The time for one Earth rotation (rotation period) would double.
 (4) The time for one Earth revolution (orbital period) would decrease.

83. According to the big bang theory, the universe began as an explosion and is still expanding. This theory is supported by observations that the stellar spectra of distant galaxies show a

- (1) concentration in the yellow portion of the spectrum
 (2) concentration in the green portion of the spectrum
 (3) shift toward the blue end of the spectrum
 (4) shift toward the red end of the spectrum

84. In order to describe the apparent daily motion of stars, a person must observe the
- (1) locations of several stars at the same time
 - (2) brightness of several stars over a period of time
 - (3) position of one particular star at one particular time
 - (4) position of one star relative to the horizon over a period of time
85. Which statement best describes the geocentric model of our solar system?
- (1) The Earth is located at the center of the model.
 - (2) All planets revolve around the Sun.
 - (3) The Sun is located at the center of the model.
 - (4) All planets *except* the Earth revolve around the Sun.
86. An observer in New York State sees different constellations in the winter nighttime sky than she sees in the summer nighttime sky. Which statement best explains the reason for this difference?
- (1) The Earth rotates on its axis.
 - (2) The Earth revolves around the Sun.
 - (3) Constellations revolve around the Earth.
 - (4) Constellations revolve around the Sun.
87. The most abundant element on the sun is
- | | |
|--------------|------------|
| (1) hydrogen | (3) carbon |
| (2) helium | (4) oxygen |
88. Planet *A* has a greater mean distance from the Sun than planet *B*. On the basis of this fact, which further comparison can be correctly made between the two planets?
- (1) Planet *A* is larger.
 - (2) Planet *A*'s revolution period is longer.
 - (3) Planet *A*'s speed of rotation is greater.
 - (4) Planet *A*'s day is longer.
89. The gravitational attraction between the Earth and the Sun is greatest at the time when the
- (1) Earth is moving slowest in its orbit
 - (2) Earth is moving fastest in its orbit
 - (3) Northern Hemisphere is receiving maximum intensity of insolation
 - (4) Northern Hemisphere is receiving maximum duration of insolation
90. Which statement best describes galaxies?
- (1) They are similar in size to the solar system.
 - (2) They contain only one star but hundreds of planets.
 - (3) They may contain a few hundred stars in a space slightly larger than the solar system.
 - (4) They may contain billions of stars in a space much larger than our solar system.
91. The probable fate of our sun is
- (1) to expand as a red giant, undergo a nova outburst and end as a white dwarf
 - (2) to shrink to a white dwarf then eventually expand to a red giant
 - (3) become hotter and expand into a blue supergiant
 - (4) to become a black hole
92. Which observation can *not* be explained by a geocentric model?
- (1) Stars follow circular paths around Polaris.
 - (2) The Sun's path through the sky is an arc.
 - (3) A planet's apparent diameter varies.
 - (4) A freely swinging pendulum appears to change direction.
93. Which change always occurs as the distance between the Earth and the Sun decreases?
- (1) The gravitational force between the Earth and the Sun decreases.
 - (2) The Sun's apparent diameter decreases.
 - (3) The Sun's rate of rotation increases.
 - (4) The Earth's orbital speed increases.
94. If viewed from the Earth over a period of several years, the apparent diameter of Mars will
- | | |
|-------------------------|-----------------------------|
| (1) decrease constantly | (3) remain unchanged |
| (2) increase constantly | (4) vary in a cyclic manner |
95. The period of time a planet takes to make one revolution around the Sun is most dependent on the planet's average
- | | |
|-------------------|-----------------------------|
| (1) rotation rate | (3) insolation from the Sun |
| (2) mass | (4) distance from the Sun |
96. The average temperature of the planets
- (1) increases with greater distance from the Sun
 - (2) decreases with greater distance from the Sun
 - (3) has no relationship to the distance from the Sun
 - (4) depends only on the chemical composition of the atmosphere of each planet
97. Base your answer to the following question on the *Earth Science Reference Tables*.
- A Red giant star would most likely have a temperature of
- | | |
|--------------|--------------|
| (1) 5,000°C | (3) 20,000°C |
| (2) 10,000°C | (4) 30,000°C |
98. Base your answer to the following question on the *Earth Science Reference Tables*.
- Red giant stars have greater luminosity than our sun mainly because they are
- | | |
|------------------|------------|
| (1) hotter | (3) larger |
| (2) farther away | (4) older |

99. In which list are celestial features correctly shown in order of increasing size?
- (1) galaxy → solar system → universe → planet
 - (2) solar system → galaxy → planet → universe
 - (3) planet → solar system → galaxy → universe
 - (4) universe → galaxy → solar system → planet
100. Which motion causes the Moon to show phases when viewed from the Earth?
- (1) the rotation of the Moon on its axis
 - (2) the revolution of the Moon around the Earth
 - (3) the rotation of the Sun on its axis
 - (4) the revolution of the Sun around the Moon
101. The giant planets are composed primarily of
- (1) hydrogen and helium (3) iron
 - (2) carbon dioxide (4) rocky materials
102. The tilt of the Earth on its axis is a cause of the Earth's
- (1) uniform daylight hours
 - (2) changing length of day and night
 - (3) 24-hour day
 - (4) 365 $\frac{1}{4}$ -day year
103. In New York State, solar noon occurs each day when the
- (1) Sun is at its highest altitude
 - (2) Sun is directly overhead
 - (3) clock reads 12 o'clock noon
 - (4) observer's shadow is longest
104. The Coriolis effect provides evidence that the Earth
- (1) has a magnetic field (3) revolves around the Sun
 - (2) has an elliptical orbit (4) rotates on its axis
105. If the Earth's rate of rotation decreased, there would be an increase in the
- (1) length of the seasons
 - (2) Sun's angle of insolation at noon
 - (3) number of observable stars at night
 - (4) length of time for one Earth day
106. Which change would occur if the Earth's rate of rotation were to increase?
- (1) The year would be shorter. (3) The year would be longer.
 - (2) The day would be shorter. (4) The day would be longer.
107. The actual shape of the Earth's orbit around the Sun is best described as
- (1) a very eccentric ellipse (3) an oblate spheroid
 - (2) a slightly eccentric ellipse (4) a perfect circle
108. The force of gravity between two objects will be greatest if their masses are
- (1) small and they are far apart
 - (2) small and they are close together
 - (3) large and they are far apart
 - (4) large and they are close together
109. The best evidence that the distance between the Moon and the Earth varies is provided by the apparent change in the Moon's
- (1) shape (3) altitude
 - (2) diameter (4) phase
110. The Earth is slightly flattened from a perfect spherical shape because of
- (1) its rotation
 - (2) the pull of the sun and moon
 - (3) storms on the sun's surface
 - (4) its molten core
111. An astronomical unit (A.U.) is
- (1) a term for defining the luminosity of a star
 - (2) the average distance from the Earth to the sun
 - (3) the average distance of any given planet to the sun
 - (4) equal to a light year
112. Whether a planet or moon has an atmosphere depends mostly upon its
- (1) orbital speed. (3) distance from the sun
 - (2) mass (4) temperature
113. The unit most used by astronomers to express the distances to other galaxies is
- (1) miles (3) astronomical unit (AU)
 - (2) kilometers (4) Lightyears (LY)
114. When observed from a location in New York State for one night, the North Star (Polaris) appears to
- (1) rise in the east and set in the west
 - (2) rise in the west and set in the east
 - (3) move southward along an arc-shaped path
 - (4) remain stationary in the sky
115. An observer in New York State notices that the Sun appears higher in the sky at solar noon each successive day for 1 month. During which month could these observations have been made?
- (1) May (3) November
 - (2) September (4) December
116. Base your answer to the following question on the *Earth Science Reference Tables*.
- Which of the following stars is least bright?
- (1) the sun (3) a white dwarf
 - (2) a blue supergiant (4) a red giant

117. At which Earth latitude is the Sun *never* directly overhead at noon?
- (1) 42° North (3) 0°
(2) 20° North (4) 5° South
118. As the sun ages it will be composed of
- (1) more hydrogen and less helium
(2) more helium and less hydrogen
(3) more oxygen and less carbon
(4) less oxygen and more carbon
119. The apparent changing direction of a large, freely swinging pendulum can be used as evidence that Earth is
- (1) rotating (3) tilted on its axis
(2) revolving (4) wobbling on its axis
120. Winds appear to curve toward the right in the Northern Hemisphere. This curving to the right is caused by the Earth's
- (1) revolution (3) size
(2) rotation (4) shape
121. During which season in the Northern Hemisphere does the Earth reach its greatest distance from the Sun?
- (1) winter (3) spring
(2) summer (4) fall
122. A belt of asteroids is located an average distance of 503 million kilometers from the Sun. Between which two planets is this belt located?
- (1) Mars and Jupiter (3) Jupiter and Saturn
(2) Mars and Earth (4) Saturn and Uranus
123. During which month does the Sun rise north of due east in New York State?
- (1) February (3) October
(2) July (4) January
124. To an observer on Earth, how many degrees does the Sun appear to move across the sky in 4 hours?
- (1) 96° (3) 48°
(2) 60° (4) 4°
125. Which characteristic of the atmosphere is modified most by the Earth's rotation?
- (1) composition (3) movement
(2) density (4) height
126. The day and the year, as units of time, are based upon motions of
- (1) the Earth (3) the Sun
(2) the Moon (4) distant stars
127. How long does Earth take to complete one orbit around the Sun?
- (1) 1 day (3) 1 year
(2) 1 month (4) 1 decade
128. Which planet's orbital shape would be most similar to Jupiter's orbital shape?
- (1) Uranus (3) Venus
(2) Pluto (4) Mercury
129. Which of the following planets is a terrestrial planet?
- (1) Jupiter (3) Mars
(2) Saturn (4) Neptune
130. Which mineral is an ore of iron and has a characteristic reddish brown streak?
- (1) magnetite (3) hematite
(2) pyrite (4) olivine