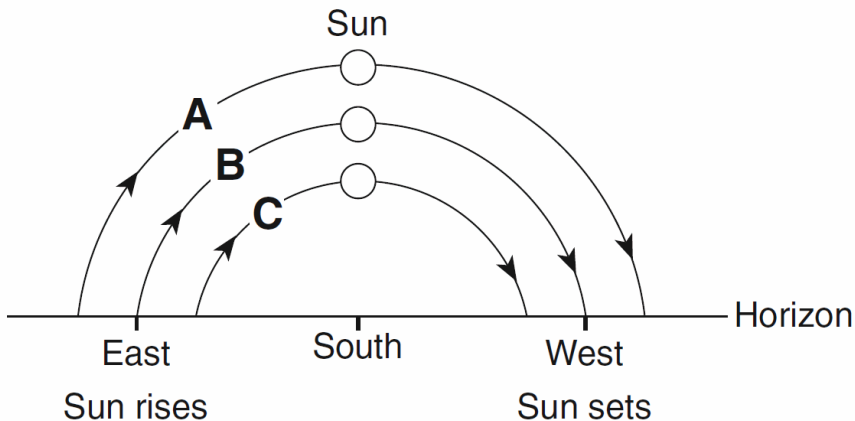


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3. What is the approximate time of day represented at each location?

- A) 6:00 a.m. B) 9:00 a.m. C) 3:00 p.m. D) 6:00 p.m.

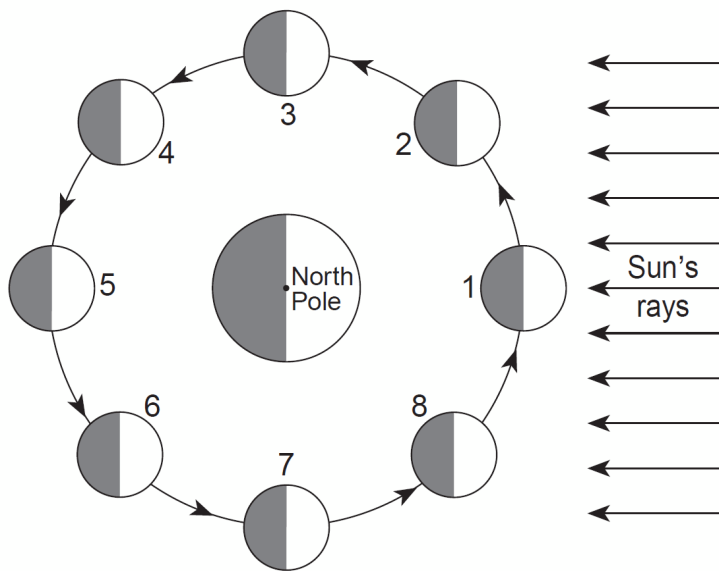
4. The diagram below represents the horizon and the Sun's apparent paths, *A*, *B*, and *C*, on three different dates, as viewed from the same location in New York State.



Which path shows the greatest duration of insolation?

- A) Path B B) Path A C) Path C

Base your answers to questions 5 through 9 on the diagram below and on your knowledge of Earth science. The diagram represents eight numbered positions of the Moon in its orbit around Earth.



(Not drawn to scale)

5. A solar eclipse might be observed from Earth when the Moon is at which position?

- A) 1 B) 5 C) 3 D) 7

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6. At which 2 positions of the Moon would the Lowest High Tides and the Highest Low Tides be recorded for an observer on Earth?

- A) Positions 3 and 7
 B) Positions 4 and 8
 C) Positions 1 and 5
 D) Positions 2 and 6

7. Which phase of the Moon will be observed in New York State when the Moon is at position 4?

- A)  B)  C)  D) 

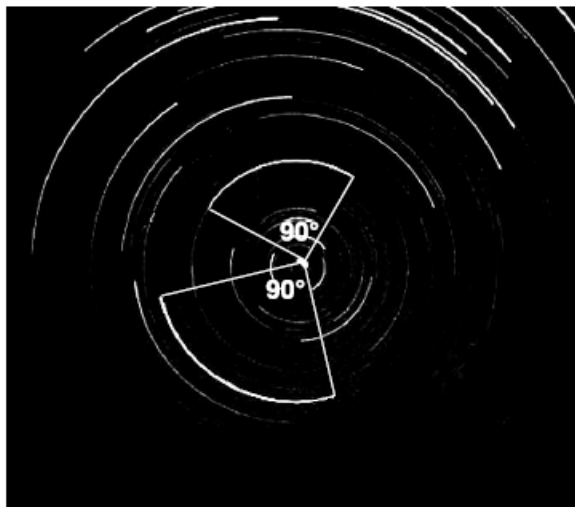
8. Which phase of the Moon will be observed in New York State when the Moon is at position 8?

- A)  B)  C)  D) 

9. A lunar eclipse might be observed from Earth when the Moon is at which position?

- A) 1 B) 5 C) 3 D) 7

10. A camera was placed in an open field and pointed toward the northern sky. The lens of the camera was left open for a certain amount of time. The result is shown in the photograph below. The angle of the arc through which two of the stars appeared to move during this time exposure is shown.



How many hours was the lens left open to produce the photograph?

- A) 12 B) 2 C) 6 D) 4

11. Which location on the Earth would the Sun's vertical rays strike on December 21?

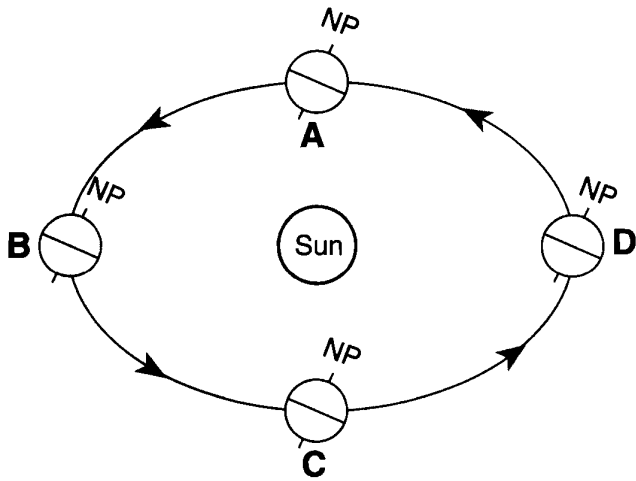
- A) Equator (0°)
 B) South Pole (90° S)
 C) Tropic of Cancer ($23\frac{1}{2}^\circ$ N)
 D) Tropic of Capricorn ($23\frac{1}{2}^\circ$ S)

12. Evidence that Earth revolves around the Sun is provided by the

- A) apparent rising and setting of *Polaris* during one day
 B) apparent rising and setting of the Sun during one day
 C) hourly changes in the apparent direction of the swing of a Foucault pendulum
 D) seasonal changes in the apparent positions of constellations

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Base your answers to questions 13 through 15 on the diagram below, which represents Earth revolving around the Sun. Letters *A*, *B*, *C*, and *D* represent Earth's location in its orbit on the first day of the four seasons. NP represents the North Pole.



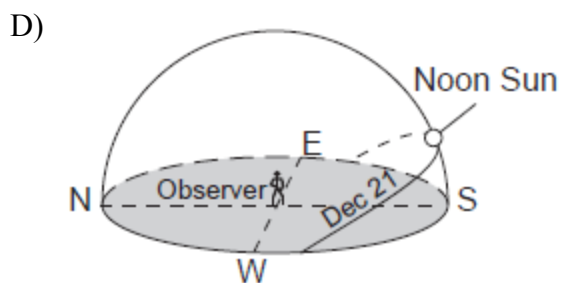
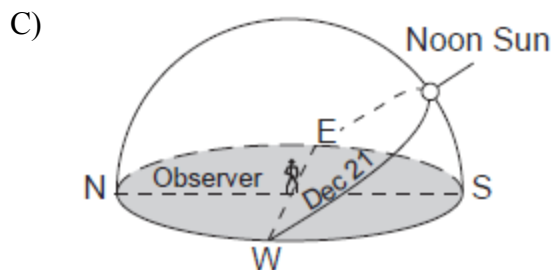
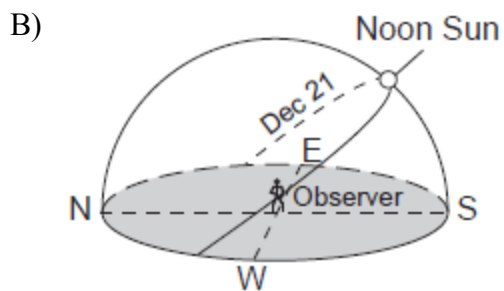
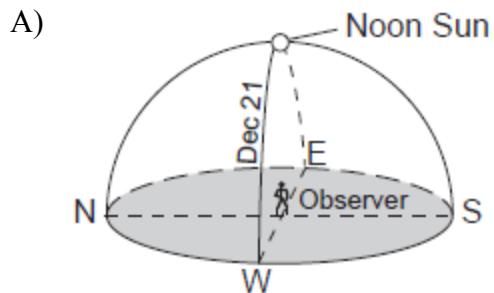
(Not drawn to scale)

13. If the tilt of Earth's axis were decreased from 23.5° to 15° , New York State's winters would become

- A) cooler, and summers would become cooler
- B) warmer, and summers would become cooler
- C) cooler, and summers would become warmer
- D) warmer, and summers would become warmer

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14. Which diagram best represents the Sun's apparent path as seen by an observer at 43.5° N latitude on December 21?



15. Which location in Earth's orbit represents the first day of summer in New York State?

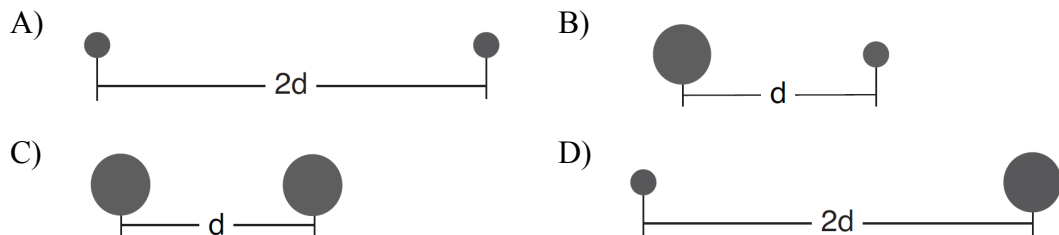
- A) *A* B) *B* C) *C* D) *D*

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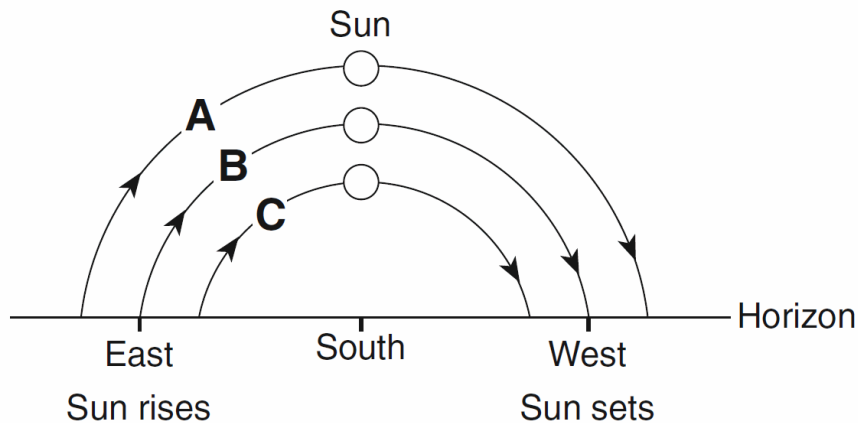
16. The symbols below represent star masses and distances.

- represents a star with a mass the same as the Sun's mass
- represents a star with a mass greater than the Sun's mass
- d represents a certain distance between star centers
- $2d$ represents twice the distance between star centers

Which diagram shows two stars that have the greatest gravitational force between them?



17. The diagram below represents the horizon and the Sun's apparent paths, *A*, *B*, and *C*, on three different dates, as viewed from the same location in New York State.



Which table correctly shows the dates on which the apparent paths of the Sun were observed?

A)

| Path of Sun | Date |
|-------------|--------------|
| A | March 21 |
| B | September 23 |
| C | June 21 |

B)

| Path of Sun | Date |
|-------------|-------------|
| A | December 21 |
| B | March 21 |
| C | June 21 |

C)

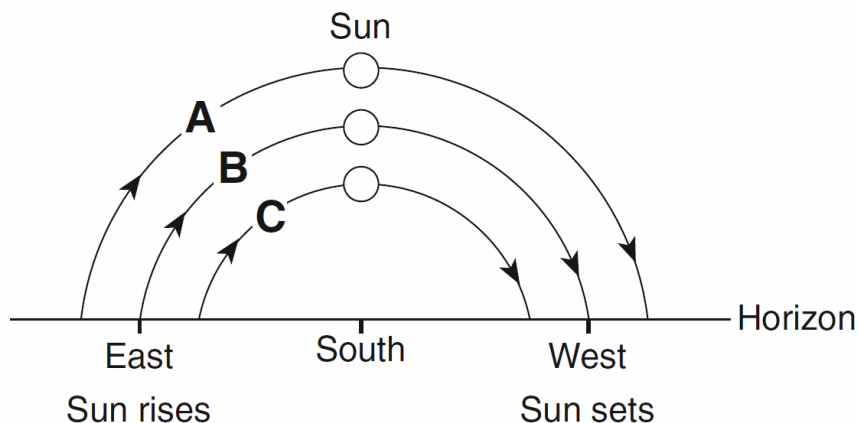
| Path of Sun | Date |
|-------------|--------------|
| A | December 21 |
| B | September 23 |
| C | March 21 |

D)

| Path of Sun | Date |
|-------------|-------------|
| A | June 21 |
| B | March 21 |
| C | December 21 |

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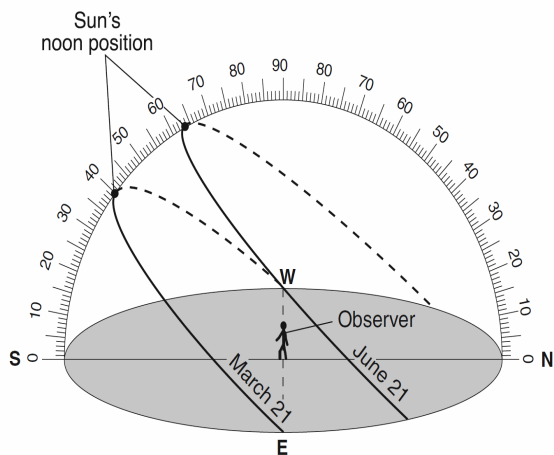
18. The diagram below represents the horizon and the Sun's apparent paths, *A*, *B*, and *C*, on three different dates, as viewed from the same location in New York State.



If the sun was located at the position of the "B", what time of day would it be?

- A) Sunrise B) Noon C) 3 PM D) 9 AM

19. Base your answer to the following question on diagram and data table below. The diagram represents the Sun's apparent paths as viewed by an observer located at 50° N latitude on June 21 and March 21. The data table shows the Sun's maximum altitude for the same two dates of the year. The Sun's maximum altitude for December 21 has been left blank.



Data Table

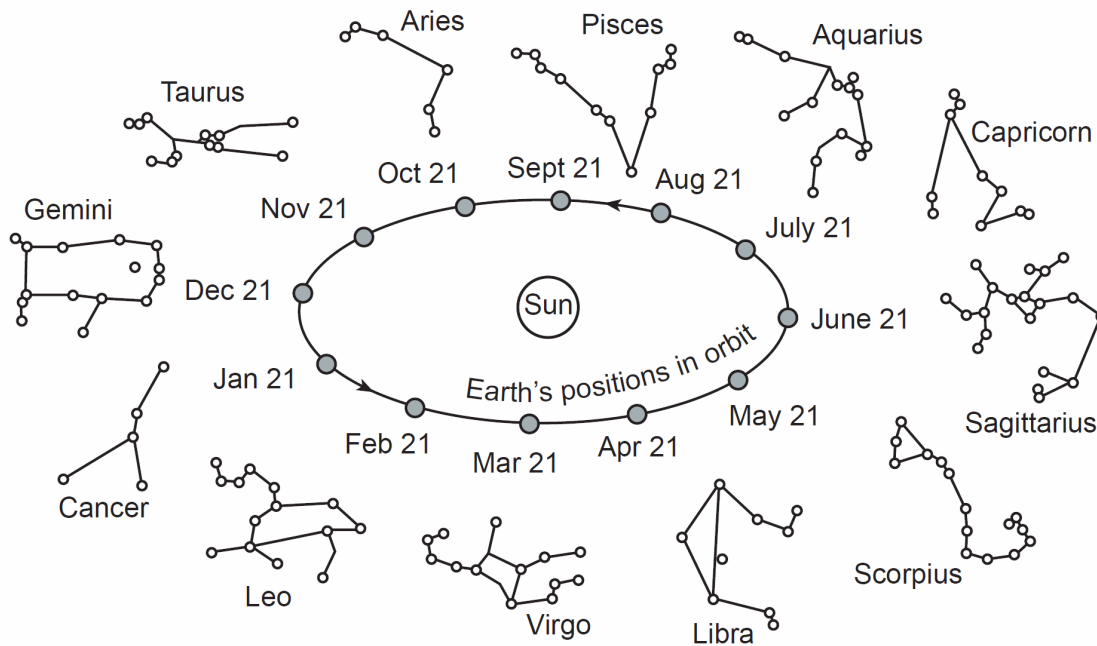
| Date | Sun's Maximum Altitude |
|-------------|------------------------|
| June 21 | 63.5° |
| March 21 | 40° |
| December 21 | |

Which statement best compares the intensity and angle of insolation at noon on March 21 and June 21?

- A) The intensity of insolation is greatest on June 21 and the angle of insolation is greatest on March 21.
 B) The intensity of insolation is greatest on March 21 and the angle of insolation is greatest on June 21.
 C) The intensity and angle of insolation are greatest on March 21.
 D) The intensity and angle of insolation are greatest on June 21.

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20. The diagram below represents positions of Earth in its orbit around the Sun and twelve constellations that can be seen in the midnight sky by an observer in New York State at different times of the year. The approximate locations of the constellations in relation to Earth's orbit are shown.



(Not drawn to scale)

Which date is correctly paired with two constellations that can be seen in the sky at midnight?

- A) August 21: Libra and Virgo
- B) May 21: Scorpius and Taurus
- C) February 21: Leo and Cancer
- D) November 21: Gemini and Capricorn