



Here is a real-life example that students living in New York will be able to relate to. It is a simulated illustration, not drawn to scale, that combines a real photo enhanced with graphics.

Sunrise Highway runs east-west on Long Island, New York. Motorists frequently encounter a blinding sun that makes driving safely very difficult. It is a road so appropriately named for a direct "on-road" Spring and Fall sunrise and sunset.

Notice the difference between the positions of the sun along Sunrise Highway for the given dates in the 3 photos.

Driving East on Sunrise Highway Towards Sunrise Early in the morning on March 21 or Sept. 21

**EAST**

Glaring sun in the driver's eyes



Driving East in the morning on:  
3/21 and 9/21

This 1999 photo shows the eastbound Sunrise Highway (NY 27) at EXIT 40 (NY 231 / Babylon-Northport Expressway and Suffolk CR 34) in North Babylon. (Photo by Steve Anderson.)

Driving East on Sunrise Highway Towards Sunrise Early in the morning on Dec. 21

**EAST**

Sun is slightly SOUTH of EAST & Not in the driver's eyes

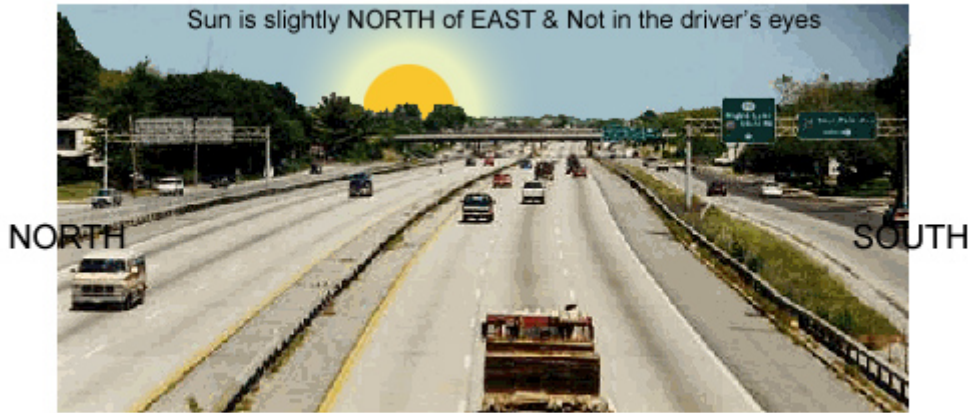
Driving East in the morning on:  
12/21



This 1999 photo shows the eastbound Sunrise Highway (NY 27) at EXIT 40 (NY 231 / Babylon-Northport Expressway and Suffolk CR 34) in North Babylon. (Photo by Steve Anderson.)

Driving East on Sunrise Highway Towards Sunrise Early in the morning on June 21

**EAST**



This 1999 photo shows the eastbound Sunrise Highway (NY 27) at EXIT 40 (NY 231 / Babylon-Northport Expressway and Suffolk CR 34) in North Babylon. (Photo by Steve Anderson.)

**Driving East in the morning on: 6/21**

Credit for photo, which was modified for this lesson: Steve Anderson.

To see a real-time animation of how drivers see the sun at different times of the year, **visit this website** and Click on the little box to the top/right that says Inter- Activity.

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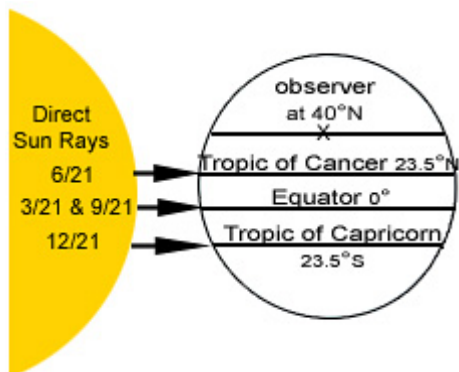
### DIRECT SUN RAYS

Can they ever be at 90° right over *your* head?

The sun's direct rays (overhead at 90° known as "zenith") can only strike one given place at any one given time. Throughout the year, these sun rays migrate (due to Earth's axis tilt and revolution) from the Tropic of Capricorn (23.5° S) through the Equator (0°) and to the Tropic of Cancer (23.5° N) and then back down again to the Tropic of Capricorn.

The sun's direct rays NEVER shine directly overhead for anyone living above or below these 23.5° latitudes. The sun position will always "lean" towards the southern sky for a person living in the northern hemisphere and "lean" towards the northern sky for a person living in the southern hemisphere.

Consider the following illustration. Given a northern latitude of 40° N, the highest latitudinal position for direct sun rays is the Tropic of Cancer at 23.5°N on June 21, which is Summer in the northern hemisphere. Even this northernmost position of the sun's rays still places direct sunlight south of the observer's position.



So, northern hemisphere observers! Look towards your southern sky to see the sun.  
Southern hemisphere observers! Look towards your northern sky to see the sun.

Are you ready to apply what you have learned?  
Continue on to page 4 and answer the questions.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Class: \_\_\_\_\_ Teacher: \_\_\_\_\_

### Changing Sun Positions in the Sky Assignment

To complete this worksheet read pages 1-3. Read all the facts and carefully study all illustrations. Place your answers on the blanks provided.

1. The sun rises due east and sets due west on what date? \_\_\_\_\_
2. In what direction does the sun rise on June 21 for an observer in the northern hemisphere? \_\_\_\_\_
3. In what direction does the sun rise on Dec 21 for an observer in the northern hemisphere? \_\_\_\_\_
4. In what direction does the sun set on June 21 for an observer in the southern hemisphere? \_\_\_\_\_
5. In what direction does the sun set on Dec 21 for an observer in the southern hemisphere? \_\_\_\_\_
6. What causes the sun's rays to shift position throughout the year?

Explanation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. State the latitude location of direct sun rays for the following dates. Include both the **name** of the latitude line and its **degree with units**.

March 21: \_\_\_\_\_

Sept 21: \_\_\_\_\_

Dec 21: \_\_\_\_\_

June 21: \_\_\_\_\_

8. For an observer in the northern hemisphere in what general direction in the sky would he/she have to look in order to see the sun on any day of the year.

Answer: Towards the \_\_\_\_\_.

9. Can a person living in New York State ever see the sun directly overhead at 90°? Why or why not?

Explanation: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

10. Where would a person have to live in order to see the sun at zenith at some time(s) of the year? State a known latitude line name (not degree) and there may be more than one.

\_\_\_\_\_  
\_\_\_\_\_

11. Your friend is complaining that when she drove to work this morning the sun was glaring in her eyes, making it very difficult to see. What consolation can you give to your friend so she will know "this too shall pass"?

Answer: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

12. If a person were to drive WEST on Sunrise Highway, on what date and general time of the day would he/she have difficulty driving because the sun would be shining directly into a person's eyes?

Answer: Date: \_\_\_\_\_ General Time of Day: \_\_\_\_\_

13. Think! If a person were to drive WEST on Sunrise Highway on December 21, would he/she see the sun set towards their left car window or towards their right car window?

Answer: \_\_\_\_\_

14. Would that direction be slightly to the NORTH or slightly to the SOUTH?

Answer: \_\_\_\_\_

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References and Credits:

- Astronomy Answers - Astronomy Answer Book: The Position of the Sun.
- Curious About Astronomy? Ask An Astronomer.
- Iowa State University: Polaris Project Evening Star; Sunrise, Sunset, & Star-rise, Star-set.
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