

The Earth rotates from west to east, but the sun, moon, stars and planets rise in the east and set in the west. In this exercise you will prove that this must happen using geometric skills. Follow the Construction instructions in Part 1 to draw the figure and label the relevant points, line segments and angles, then answer the accompanying questions and construct the Proof.

**Construction:**

- 1 Draw a circle with center O
- 2 Draw the vertical radius OA
- 3 Draw radius OB to the right of OA such that AOB is an acute angle
- 4 Draw a ray tangent to radius OA
- 5 Draw a ray tangent to radius OB intersecting the tangent ray to OA at point C
- 6 Extend radius OB so that it intersects the tangent to radius OA at point D
- 7 Draw segment DF where point F is on the tangent to radius OB
- 8 Draw a ray, parallel to AD that intersects the circle at point B, and the segment DF at point E
- 9 Extend ray BE so that it intersects radius AO at point G

**Givens:**

AD parallel to GE  
CD perp DE  
BE perp DF

**Problem 1:** Prove Triangle ADO is congruent to Triangle CDF

**Problem 2:** Prove Angle AOB equals angle EBF

**Problem 3:** Draw a second diagram similar to the one in Problem 1 but in which  $m\angle AOB$  is increased. Re-perform the Proof in Problem 1. Prove that, as  $m\angle AOB$  increases that  $m\angle EBF$  remains equal to  $m\angle AOB$  and increases as well.

Suppose that the circle represents Earth, and you are looking down at it from above the north pole. Earth rotates from west to east in the diagram. Suppose that the tangent line CF represents the horizon line for Observer B, and that a few hours later, Earth has rotated eastwards so that Observer B is now located at Point A with a local horizon defined by ray AD. Suppose that Observer B sees the sun located along the ray direction BE

**Problem 4:** Prove that the direction of the sun from Observer Bs location is in the western sky.

**Problem 5:** Prove that the direction of the sun aster a few hours at Point A is at the western horizon.

**Problem 6:** Explain how the observation that objects rise in the east and set in the west require that Earth rotate from west to east.

