

Advanced Cartography: Scientific Principles and Theories

Cartography · Answer Key · 8 Questions

1. Which geodetic datum is the current standard for GPS and is characterized by its use of the Earth's center of mass as the origin, and its reference ellipsoid being WGS84?

- A) NAD83 (North American Datum of 1983)
- B) GDA94 (Geodetic Datum of Australia 1994)
- C) ED50 (European Datum 1950)
- D) WGS84 (World Geodetic System 1984)**

2. The concept of 'Tissot's indicatrix' is a geometrical tool used to visualize the distortions inherent in a map projection. What does the shape and area of these ellipses represent on a projected surface?

- A) The variation in scale and angle from the theoretical undistorted grid**
- B) The elevation differences of the mapped terrain
- C) The accuracy of the surveyed control points
- D) The density of the contour lines

3. In cartography, the Equidistant Cylindrical projection preserves distances from a single point or along specific lines. What is the mathematical property that defines this projection's behavior?

- A) All meridians are projected as parallel straight lines, and the latitude scale is uniform.**
- B) Parallels are projected as equally spaced straight lines, and meridians are equally spaced straight lines.
- C) Great circles are projected as straight lines, and true shape is maintained.
- D) Area is preserved, and all parallels are projected as straight lines.

4. What is the primary geodetic challenge in creating accurate maps of polar regions using standard map projections like Mercator, and why?

- A) Extreme distortion of shape and area due to the projection of a sphere onto a cylinder tangent at the equator**
- B) The convergence of meridians at the poles, leading to infinitely stretched areas
- C) The difficulty in establishing accurate triangulation networks at very high latitudes
- D) The significant variation in gravitational pull impacting surveying equipment

5. Conformal map projections are designed to preserve angles locally. This property is critical for which specific cartographic application where maintaining correct bearings and shapes is paramount?

A) Navigational charts, especially for aviation and maritime use

- B) Thematic maps displaying population density
- C) World maps intended to show the relative sizes of continents
- D) Topographic maps with detailed elevation data

6. The geoid is a complex surface representing mean sea level, crucial for accurate vertical datums. How does the geoid differ from a perfect ellipsoid of revolution, and what physical phenomenon causes this difference?

A) The geoid is irregular due to variations in Earth's gravity caused by density differences in the mantle and crust.

- B) The ellipsoid is a mathematical simplification that perfectly approximates the geoid at all latitudes.
- C) The geoid is a smooth, mathematically defined surface, whereas the ellipsoid is affected by tectonic plate movements.
- D) The geoid is influenced by atmospheric pressure, while the ellipsoid is defined by gravitational forces only.

7. A map is said to have equal-area (or equivalent) projection properties if it preserves area. Which of the following is a primary characteristic of such projections, often at the expense of shape or distance distortion?

A) The ratio of areas on the map is the same as the ratio of areas on the Earth's surface.

- B) The scale is constant along all parallels.
- C) Angles are preserved at all points on the map.
- D) Distances from the center point to any other point are accurate.

8. The Universal Transverse Mercator (UTM) coordinate system divides the Earth into 60 zones, each 6 degrees of longitude wide. What is the central meridian's scale factor in UTM to minimize distortion within each zone?

A) 0.9996

- B) 1.0
- C) 0.9
- D) 0.99