

Advanced Geometry Facts

Geometry · Practice Test · 18 Questions

1. In which year did Leonhard Euler prove that the orthocenter, centroid, and circumcenter of a triangle are collinear on the Euler line?

- A) 1740
- B) 1750
- C) 1760
- D) 1770

2. What is the numerical value of the golden ratio (?) to five decimal places?

- A) 1.61803
- B) 1.60803
- C) 1.61805
- D) 1.60805

3. Who is credited with the formal definition of a parabola in his work 'Conics' around 200 BC?

- A) Euclid
- B) Archimedes
- C) Apollonius of Perga
- D) Ptolemy

4. The Koch snowflake, a fractal, has a dimension of approximately what value?

- A) 1.2618
- B) 1.4567
- C) 1.6094
- D) 1.8928

5. What year did René Descartes publish 'La Géométrie', which introduced Cartesian coordinates?

- A) 1637
- B) 1647
- C) 1627
- D) 1617

6. The area of a regular dodecagon (12-sided polygon) inscribed in a circle of radius 1 is equal to what numerical value?

- A) 2.983
- B) 3.106
- C) 3.215
- D) 3.459

7. Who, in 1899, first proved that a regular 69-gon could be constructed using a compass and straightedge?

- A) Carl Friedrich Gauss
- B) Niels Henrik Abel
- C) Évariste Galois
- D) David Hilbert

8. What is the exact numerical value for the ratio of the circumference of a circle to its diameter, discovered by Archimedes using polygons?

- A) 3.14159
- B) $\frac{22}{7}$
- C) 3.14
- D) Approximation between $3\frac{10}{71}$ and $3\frac{1}{7}$

9. The E8 Lie group, which has a complex geometric structure, has a dimension of what number?

- A) 18
- B) 128
- C) 248
- D) 512

10. What year did Augustin-Louis Cauchy publish his foundational work on the geometry of surfaces and differential geometry?

- A) 1815
- B) 1827
- C) 1835
- D) 1842

11. The ratio of the volume of a sphere to the volume of a cylinder that circumscribes it (sharing the same radius and height) is exactly what fraction?

- A) $\frac{1}{2}$
- B) $\frac{2}{3}$
- C) $\frac{3}{4}$
- D) $\frac{3}{5}$

12. Who, in 1832, established the impossibility of constructing a regular 17-gon with compass and straightedge, a feat only possible for prime numbers of the form $2^{2^n} + 1$?

- A) Pierre-Simon Laplace
- B) Joseph-Louis Lagrange
- C) Carl Friedrich Gauss
- D) Siméon Denis Poisson

13. What is the minimum number of colors required to color any planar map such that no two adjacent regions have the same color?

- A) 3
- B) 4
- C) 5
- D) 6

14. The concept of hyperbolic geometry, where parallel lines do not meet, was independently developed in the 1820s by which three mathematicians?

- A) Gauss, Lobachevsky, and Bolyai
- B) Euclid, Riemann, and Klein
- C) Descartes, Fermat, and Pascal
- D) Euler, Lagrange, and Laplace

15. What is the exact value of the sum of the interior angles of a convex pentagon?

- A) 540 degrees
- B) 720 degrees
- C) 900 degrees
- D) 1080 degrees

16. The discovery of the Platonic solids is traditionally attributed to which ancient Greek philosopher, who described them in his work 'Timaeus' around 360 BC?

- A) Aristotle
- B) Pythagoras
- C) Plato
- D) Socrates

17. What is the numerical value of the angle (in degrees) of each interior angle of a regular octagon?

- A) 120
- B) 135
- C) 144
- D) 150

18. In what year did Bernhard Riemann introduce his influential paper on the foundations of geometry, which generalized Euclidean geometry and laid groundwork for general relativity?

- A) 1854
- B) 1864
- C) 1874
- D) 1884