

Perimeter - Area - Volume Outline

IMSA -- Spring 1995

I. Perimeter

- A. Basic: Distance around
- B. Difficult: of sector or segment of circle; shaded regions (see handout)
- C. Psuedo-difficult: concave
- D. Triangle perimeter = product of sides/(product of radii of circumscribed and inscribed circles)

II. Area

- A. Circle
- B. Polygons
 - 1. Regular: $.5 \text{ perimeter} \times \text{apothem}$
 - 2. Kite & rhombus: half product of diagonals
 - 3. Triangles
 - a. Regular: $.5ba$
 - b. Right: $.5L_1L_2$
 - c. Shoelace
 - d. Encasement
 - e. Pick's: $.5p+I-1$
 - f. $.5ab\sin C$
 - g. $.5(\text{perimeter})(r \text{ of inscribed circle})$
 - h. Hero's
 - 1. Product of sides/($4 \times$ radius of circumscribed circle)
 - 4. Brahmagupta (area of inscribed quadrilateral)
 - 5. Equilateral triangle: $s^2 \sqrt{3}/4$
 - 6. Regular hexagon: six equilateral triangles
 - 7. In general: Pick's and Shoelace and encasement
- C. Solids
 - 1. Prism or cylinder: Lateral area = perimeter $\times$ height
Total area: lateral area plus bases
 - 2. Cone: πrL where L is slant height
 - 3. Sphere: $4\pi r^2$
- D. Hemisphere
- E. Shaded regions
- F. Ellipse: πab

III. Volume

- A. Basic: Base area $\times$ height for prisms/cylinders; $1/3 BAh$ for pyramids/cones
- B. Sphere: $\frac{4}{3}\pi r^3$
- C. Tetrahedron: $s^3 \sqrt{2}/12$
- D. Octahedron: $s^3 \sqrt{2}/3$
- E. Other Platonic solids: $(\# \text{ of sides})(\text{face area})(\text{apothem})/3$
- F. Frustum
- G. Parallelepiped
- H. Ellipsoid: $\frac{4}{3}\pi abc$

IV. Geometric probability (see COMAP handout)

V. Ratios in similar solids

VI. Background

- A. Variables & limits on same (MI problem sets)
- B. Similarity; ratios; altitude-to-hypotenuse & angle bisector theorems, etc.
- C. Pythagorean triples (beginnings with 3-5-7-8-9-11-12-20)

