

Given on test day: memorize anyway

- ✓ Circle: $A = \pi r^2$, $C = 2\pi r$; 360° or 2π radians
- ✓ Sphere: $V = \frac{4}{3}\pi r^3$, surface area $4\pi r^2$
- ✓ Rectangle $A = lw$; triangle $A = \frac{1}{2}bh$, angles sum to 180°
- ✓ Pythagorean theorem: $a^2 + b^2 = c^2$
- ✓ 30° - 60° - 90° : $1 : \sqrt{3} : 2$; 45° - 45° - 90° : $1 : 1 : \sqrt{2}$
- ✓ Everything below is not given: memorize it

Angles and polygons

- ✓ **Supplementary**: sum to 180° , as along a straight line; **complementary**: 90°
- ✓ **Vertical angles** (across from each other) are congruent
- ✓ **Parallel lines and a transversal**: all acute angles are congruent, all obtuse angles are congruent, and any acute plus any obtuse is 180°
- ✓ A quadrilateral has 360° ; any polygon $(n - 2) \times 180^\circ$, n the number of sides
- ✓ Each angle of a regular polygon: $\frac{(n - 2) \times 180^\circ}{n}$
- ✓ Or draw every diagonal from one vertex, count the triangles, and multiply by 180°

Triangles

- ✓ **Pythagorean triples**: $3 : 4 : 5$, $5 : 12 : 13$, $7 : 24 : 25$, $8 : 15 : 17$, and their multiples
- ✓ **Equilateral**: $A = \frac{s^2\sqrt{3}}{4}$, each angle 60°
- ✓ **Isosceles**: at least two equal sides and two equal angles; the altitude splits it into two congruent right triangles
- ✓ **Similar** by AA: matching angles, proportional sides
- ✓ **Congruent** by SSS, SAS, ASA or AAS, never SSA
- ✓ The largest angle is opposite the longest side
- ✓ $\sqrt{2} \approx 1.4$, $\sqrt{3} \approx 1.7$

Quadrilaterals

- ✓ Rectangle perimeter $2l + 2w$; square $A = s^2$, perimeter $4s$
- ✓ **Parallelogram**: opposite sides parallel and equal; opposite angles equal, adjacent ones supplementary
- ✓ **Rhombus**: all sides equal, diagonals perpendicular; **square**: both a rectangle and a rhombus
- ✓ **Trapezoid**: exactly one pair of parallel sides
- ✓ **Similar polygons** need matching angles **and** proportional sides: not all rectangles are similar
- ✓ Odd shapes: split them into rectangles and triangles, or subtract a smaller area from a larger one

Circles

- ✓ **Equation**: $(x - h)^2 + (y - k)^2 = r^2$, center (h, k)
- ✓ **Arc length** $\frac{n}{360} \cdot 2\pi r$; **sector area** $\frac{n}{360} \cdot \pi r^2$, n the central angle
- ✓ An arc measures the same as its **central angle**, and twice its **inscribed angle**
- ✓ A **tangent** is perpendicular to the radius where they meet
- ✓ A right triangle inscribed in a circle has the diameter as its hypotenuse
- ✓ Two radii make an isosceles triangle; a square inscribed in a circle has the diameter as its diagonal

Solids

- ✓ **Rectangular prism** $V = lwh$; **cube** $V = \text{edge}^3$
- ✓ **Cylinder** $V = \pi r^2 h$, surface area $2\pi r^2 + 2\pi rh$
- ✓ **Any prism** $V = \text{base area} \times h$; **pyramid** $\frac{1}{3} \times \text{base area} \times h$; **cone** $\frac{1}{3}\pi r^2 h$
- ✓ Estimate with $\pi \approx 3$

Scaling

- ✓ Multiply every length by k : area by k^2 , volume by k^3
- ✓ Double a circle's radius: **4×** the area. Double a sphere's radius: **8×** the volume