

Area and perimeter

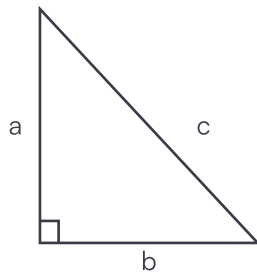
- ✓ **Area:** the space inside; **perimeter:** the distance around
- ✓ **Rectangle:** $A = lw$, $P = 2l + 2w$; its four angles total 360°
- ✓ **Square:** all four sides equal, so a side is $\sqrt{A}$: area 64 means side 8
- ✓ **Triangle:** $A = \frac{1}{2}bh$, where the height is the **altitude**, perpendicular to the base
- ✓ **Irregular shape:** split it into rectangles and triangles and add their areas

Triangles

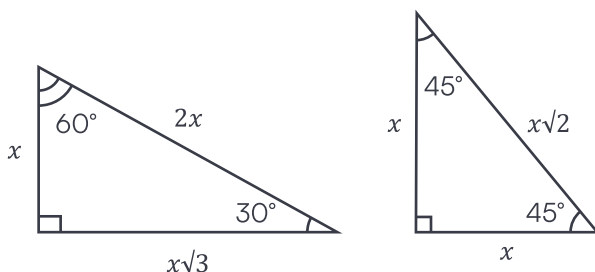
- ✓ The angles add to 180°
- ✓ **Isosceles:** two equal sides and two equal angles
- ✓ **Equilateral:** all sides equal; every angle 60°
- ✓ **Right:** one 90° angle; **obtuse:** one angle over 90° ; **acute:** all under 90°
- ✓ **Similar triangles** have the same three angles, so their sides are in proportion: $\frac{x}{8} = \frac{45}{15}$, $x = 24$

Right triangles

- ✓ **Pythagorean theorem**, for a right triangle only: $a^2 + b^2 = c^2$, with c the hypotenuse, the longest side, opposite the right angle
- ✓ Legs 5 and 12 give a hypotenuse of 13; legs 3 and 4 give 5



- ✓ **30-60-90:** sides x , $x\sqrt{3}$, $2x$, opposite the 30° , 60° and 90° angles
- ✓ **45-45-90** (isosceles right): sides x , x , $x\sqrt{2}$



Polygons

- ✓ A closed shape of three or more straight sides; **regular:** all sides and angles equal
- ✓ Quadrilateral 4 sides, pentagon 5, hexagon 6
- ✓ **Interior angles** add to $(n - 2) \times 180^\circ$ for n sides
- ✓ One angle of a regular polygon: that sum $\div$ the number of sides; a hexagon's 720° gives 120° , a pentagon's 540° gives 108°

Circles

- ✓ **Radius r :** center to edge; **diameter $d = 2r$:** edge to edge through the center
- ✓ **Chord:** any line from edge to edge; **arc:** part of the circumference
- ✓ **Area $A = \pi r^2$; circumference $C = 2\pi r$**
- ✓ A circle is 360° : the angles around its center add to 360°
- ✓ A **central angle** measures the same as the arc it cuts off
- ✓ **Arc length** $= \frac{\text{angle}}{360^\circ} \times 2\pi r$: 60° of a radius-12 circle is 4π

Radians

- ✓ $360^\circ = 2\pi$ radians; $180^\circ = \pi$; $90^\circ = \frac{\pi}{2}$
- ✓ Degrees to radians: $\times \frac{\pi}{180}$, so $120^\circ = \frac{2\pi}{3}$
- ✓ Radians to degrees: $\times \frac{180}{\pi}$, so $\frac{5\pi}{4} = 225^\circ$

Solids

- ✓ **Volume:** the area of the base $\times$ the height
- ✓ **Rectangular box:** $V = lwh$; **cylinder:** $V = \pi r^2 h$ (square the radius first)
- ✓ **Surface area:** add the area of every face; a cube has six equal squares, so side 2 gives 24
- ✓ **Density** $= \frac{\text{mass}}{\text{volume}}$, as in g/cm^3 : 180 g in a $4 \times 3 \times 5$ cm box is 3 g/cm^3