Definition: Triangle

A **triangle** is a polygon with three vertices and three sides. It is one of the fundamental shapes in geometry, formed by connecting three non-collinear Points.

Formal Definition

A triangle $\triangle ABC$ consists of: - Three distinct points A, B, C (vertices) that are not collinear - Three line segments $\overline{AB}$, $\overline{BC}$, $\overline{CA}$ (sides) - Three Angles $\angle BAC$, $\angle ABC$, $\angle BCA$ (interior angles)

Classification

By Side Lengths

- **Equilateral**: All three sides have equal length
- **Isosceles**: At least two sides have equal length
- **Scalene**: All three sides have different lengths

By Angles

- **Acute**: All interior angles are less than 90°
- **Right**: One interior angle equals 90°
- **Obtuse**: One interior angle is greater than 90°

Fundamental Properties

- The sum of interior angles equals 180° (see Angle Sum of a Triangle)
- The sum of any two sides is greater than the third side (triangle inequality)
- The area can be calculated using various formulas:
  - Heron's formula: $A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$
  - Base-height formula: $A = \frac{1}{2}bh$

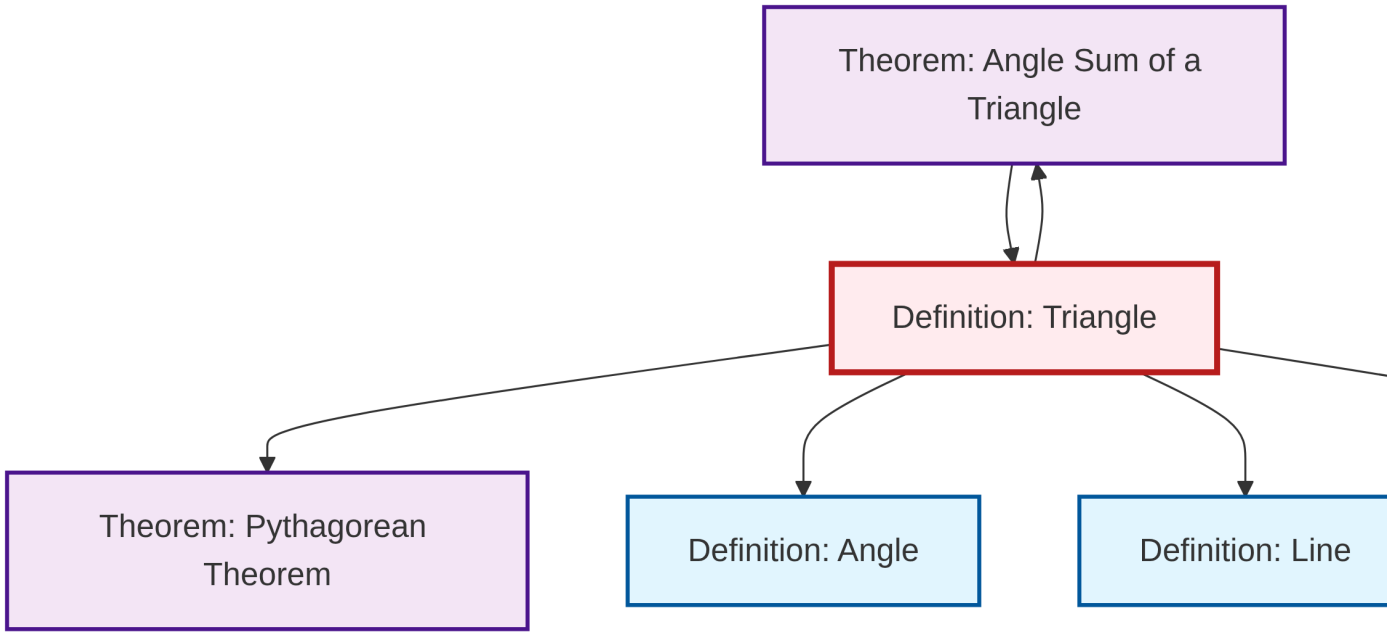
Important Elements

- **Centroid**: Intersection of medians
- **Circumcenter**: Center of circumscribed circle
- **Incenter**: Center of inscribed circle
- **Orthocenter**: Intersection of altitudes

Related Concepts

- Pythagorean Theorem applies to right triangles
- Congruence and similarity of triangles
- Trigonometric ratios defined using right triangles

Dependency Graph



Local dependency graph