# Introduction to geometry

Fundamental concepts and their incidence

- **Two different straight lines**
  - intersect,
  - are parallel
  - are non-coplanar (skew lines).
- **Two different planes**
  - intersect
  - are parallel.
- **A straight line and a plane**
 - intersect
  - are parallel.

Segment, half-line, angle

- **Segment:** The part of a straight line lying between two points.

- **Half-line:** A point of a line divides it into two half-lines (rays, infinite line segments)

- **Angle:** Two half-lines having a common point of origin divide the plane into two parts which is called angles.

Types of angle
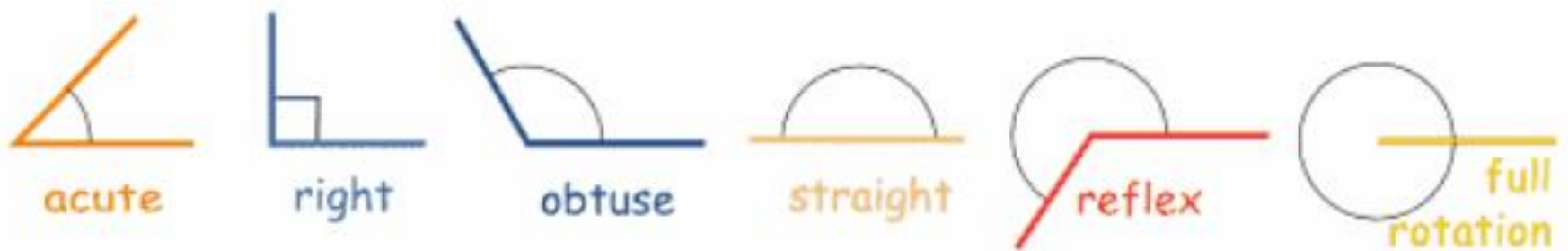
- An **acute angle** is less then 90°.
- A **right angle** is equal to 90°.
- An **obtuse angle** lies between 90° and 180°.
- A **reflex angle** is greater than 180° and less than 360°.
- **Supplementary angles** are angles whose sum is 180°.
- **Complementary angles** are angles whose sum is 90°.

Paralel lines and pairs of angles
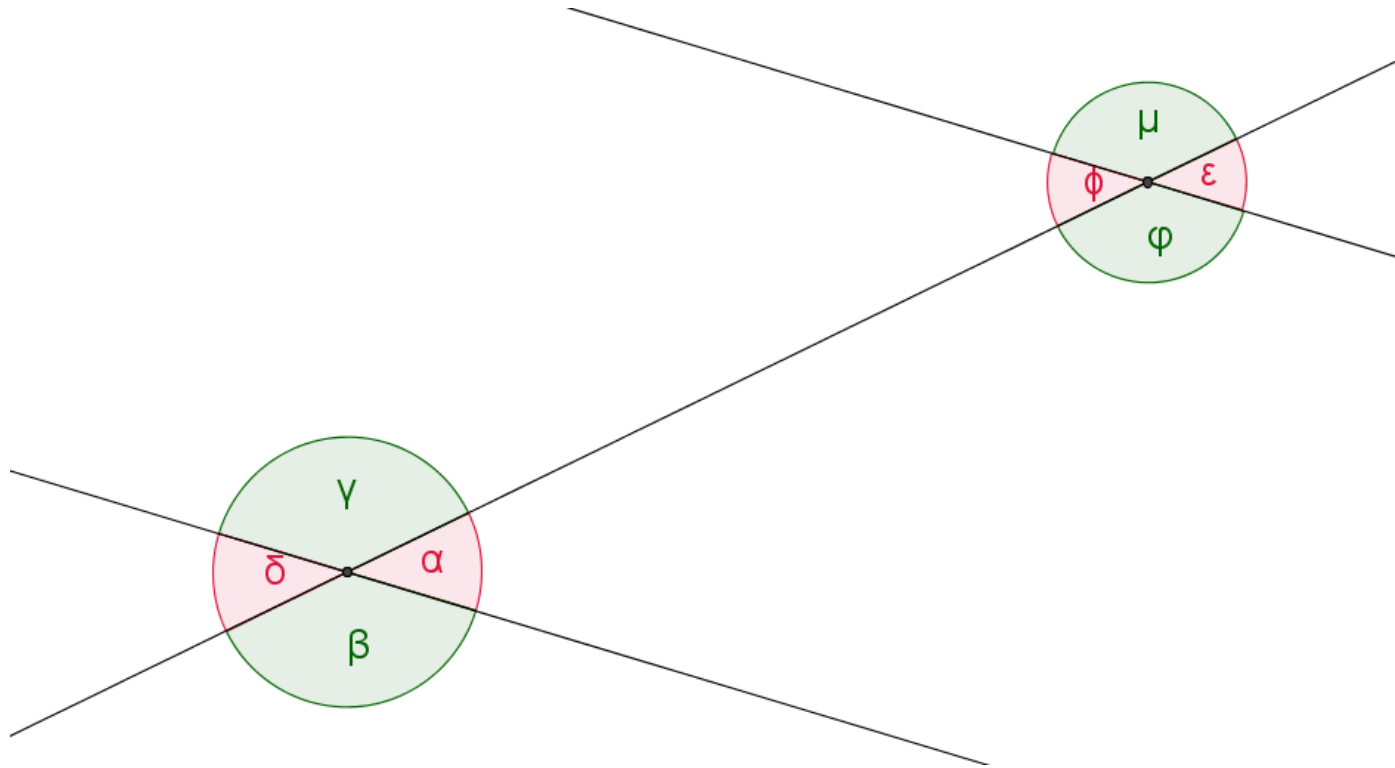
- **Corresponding angles**: $\alpha=\varepsilon$; $\phi=\delta$; $\varphi=\beta$; $\gamma=\mu$
- **Alternate interior angles**: $\alpha=\phi$; $\varphi=\gamma$;
- **Vertical angles**: $\alpha=\delta$; $\beta=\gamma$
- **Consecutive interior angles**: $\phi+\gamma=180°$; $\alpha+\varphi=180°$
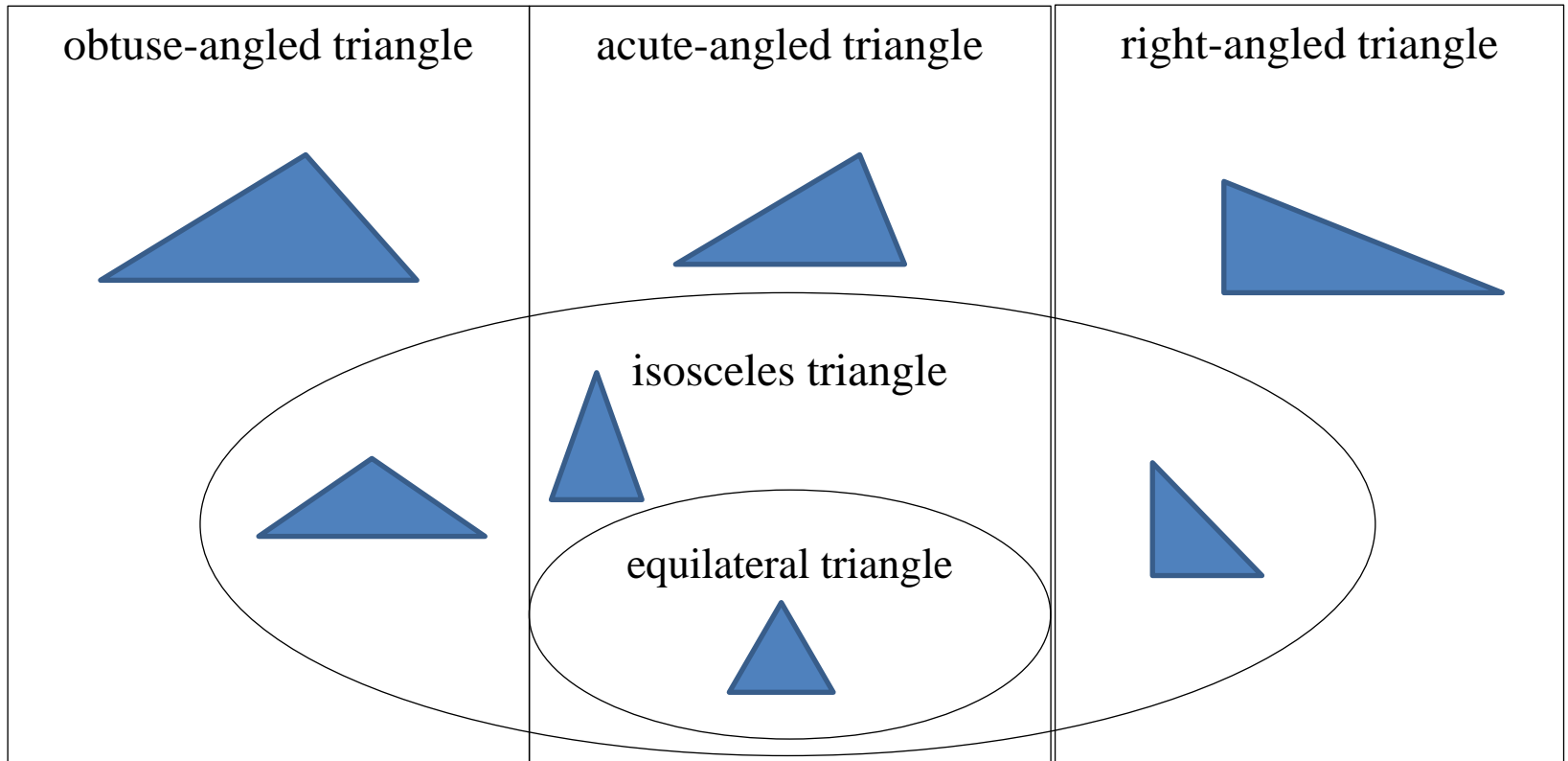
Characterization of triangles
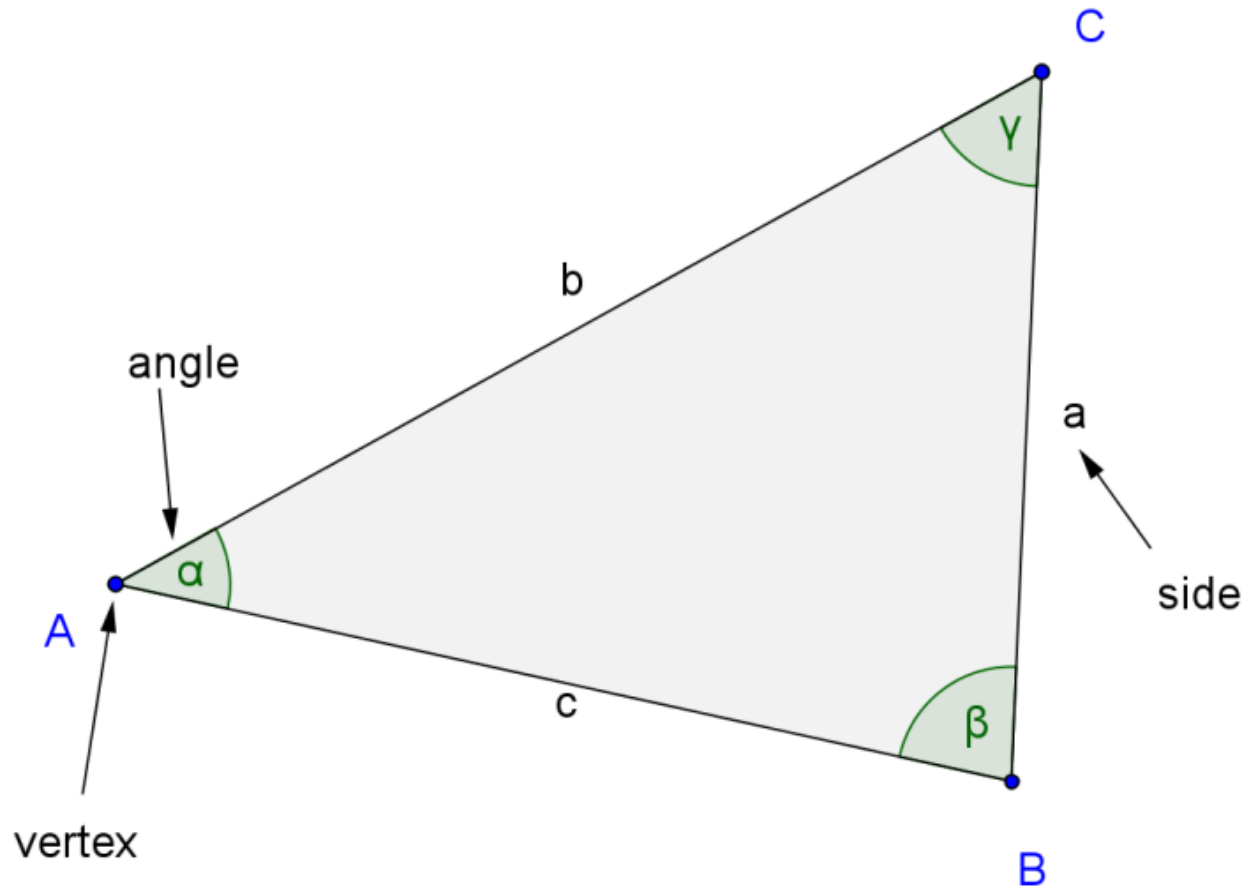
Classification of triangles

- **Classification of triangles by sides**
  - arbitrary triangle
  - isosceles triangle
  - equilateral triangle
- **Classification of triangles by angles**
  - acute-angled triangle
  - right-angled triangle or right triangle
  - obtuse-angled triangle

Classification of triangles

The relation between …

- **… the angles of a triangle:**
  - The sum of the interior angles of a triangle is $180°$.
  - The sum of an interior and its exterior angle is $180°$.
- **… the sides of a triangle:**
  - The sum of any two sides of a triangle is larger than the third side.
- **… the sides and angles of a triangle:**
  - Two sides of a triangle are equal if and only if the opposite angles are equal.
  - The side opposite the larger angle is longer than the side opposite the smaller angle.

The relation between the sides of a right triangle – The Pythagorean Theorem

hypotenuse

B

c

A

a

b

$a^2 + b^2 = c^2$

C

legs