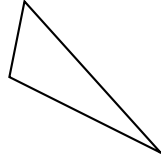


# PROPERTIES OF TRIANGLES

## A TYPES OF TRIANGLES

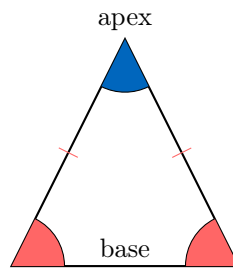
### Definition Triangle

A **triangle** is a polygon with three sides.



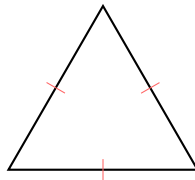
### Definition Isosceles triangle

An **isosceles triangle** is a triangle in which two sides are equal in length. The third side is called the **base**, and the vertex opposite the base is called the **apex**.



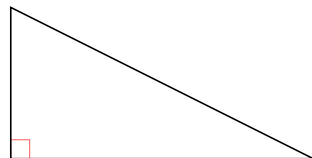
### Definition Equilateral triangle

An **equilateral triangle** is a triangle whose three sides are equal in length. It is a special case of an isosceles triangle.



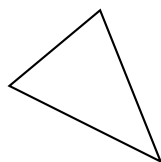
### Definition Right-angled triangle

A **right-angled triangle** is a triangle with one right angle ( $90^\circ$ ). The side opposite the right angle is called the **hypotenuse**.



### Definition Scalene triangle

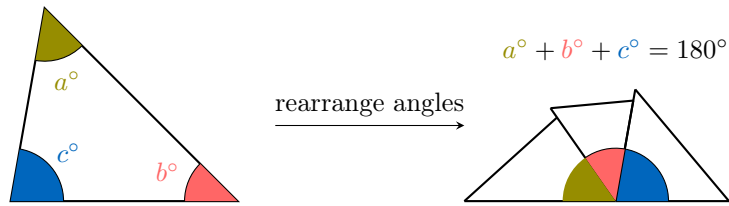
A **scalene triangle** is a triangle whose three sides have different lengths.



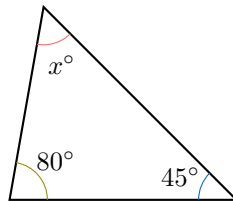
## B ANGLES

### Proposition Sum of the angles of a triangle

In any triangle, the sum of the angles is  $180^\circ$ .



**Ex:** Find the angle  $x^\circ$ .

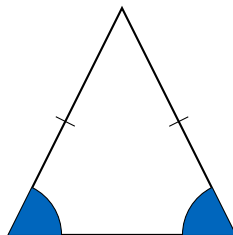


*Answer:* The sum of the angles in a triangle is  $180^\circ$ . Therefore:

$$\begin{aligned}x^\circ + 45^\circ + 80^\circ &= 180^\circ \\x^\circ + 125^\circ &= 180^\circ \\x^\circ &= 180^\circ - 125^\circ \\x^\circ &= 55^\circ\end{aligned}$$

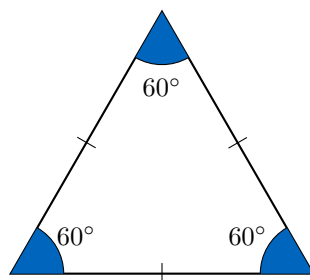
### Proposition Angles for an isosceles triangle

In any isosceles triangle, the angles opposite the equal sides (base angles) are equal.



### Proposition Angles for an equilateral triangle

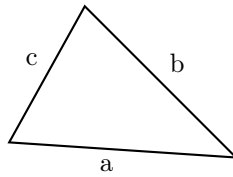
In any equilateral triangle, each angle measures  $60^\circ$ .



## C TRIANGLE INEQUALITY THEOREM

### Theorem Triangle inequality theorem

In a triangle, the length of each side must be less than the sum of the lengths of the other two sides.

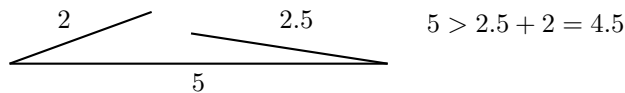


$$a < b + c$$

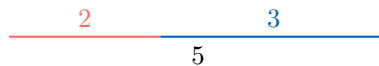
$$b < a + c$$

$$c < a + b$$

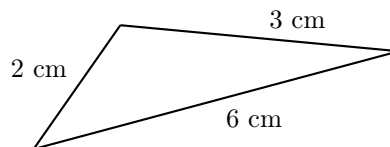
- If one side is longer than the sum of the other two sides, the sides cannot form a triangle because they do not meet to close the shape.



- If one side equals the sum of the other two sides, the result is a degenerate triangle (a straight line), which is not considered a triangle.



**Ex:** Could these be the side lengths of a triangle?



*Answer:* The triangle inequality theorem states that each side must be less than the sum of the other two sides. Check for all three sides:

- $2 < 6 + 3 = 9$  (holds)
- $3 < 6 + 2 = 8$  (holds)
- $6 \not< 3 + 2 = 5$  (does not hold)

Since not all inequalities hold, these side lengths cannot form a triangle.