SOLID MENSURATION

Mathematics

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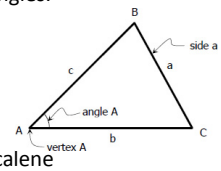
Triangles

Definition: Triangle is a polygon with three sides and three interior angles.



Classification of Triangles

1. According to **sides**
   Equilateral, Isosceles & Scalene
2. According to **angles**
   Right, Oblique(equiangular, acute & obtuse)

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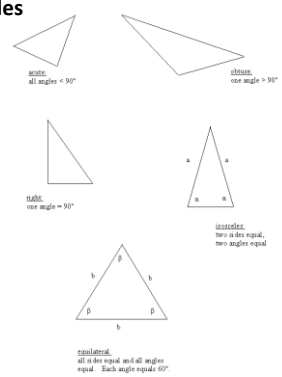
Triangles



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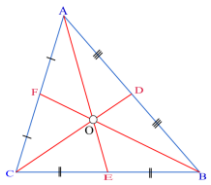
Triangles

Special Lines in a Triangle

1. Median - centroid



The length of the median can be obtained from Apollonius' theorem as:

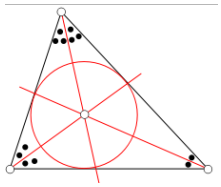
$$m_a = \sqrt{\frac{2b^2 + 2c^2 - a^2}{4}}$$

where a, b and c are the sides of the triangle and a is the side of the triangle whose midpoint is the extreme point of median m_a.

Triangles

Special Lines in a Triangle

2. Angle Bisector - incenter



If the side lengths of a triangle are a,b,c, the semiperimeter $((a + b + c) / 2)$ is s, and A is the angle opposite side a, the length of the internal bisector of angle A is

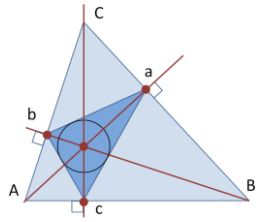
$$2[bcs(s - a)]^{1/2} / (b + c).$$

Triangles

Special Lines in a Triangle

3. Altitude(Height) - orthocenter

$$h_a = \frac{2A_\Delta}{a}$$



Triangles

Principles:

1. The sum of the three angles in any triangle will always be equal to 180°.

2. The longest side of any triangle is always opposite the largest angle even as the shortest side is opposite the smallest angle.

3. No side of any angle can be as long as the sum of the other two side length.

Triangles

Principles:

4. If the legs of a right triangle are equal, then each acute angle contains 45°.

If two angles of an isosceles triangle are equal, then The sides opposite these angles are equal.

Each angle in an equilateral or equiangular triangle measures 60°

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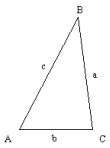
Triangles

Formulas:

Area $K = \frac{base \times height}{2}$

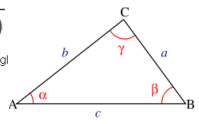


$$K = ab\frac{\sin(C)}{2}$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

where s is the semiperimeter of the triangl

$$s = \frac{a+b+c}{2}.$$



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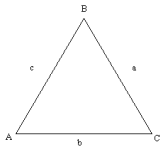
Formulas:

Area(Equilateral) $K = a^2\frac{\sqrt{3}}{4}$



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Exercises:

1. The altitude of an equiangular triangle is 12 cm, find the length of one side.

2. Given that the perimeter of a triangle is 180 in. If the angles are in the ratio 5:6:7. Determine the sides of the triangle.