Law of Sines

Trigonometry

Introduction

Definition - Oblique Triangles

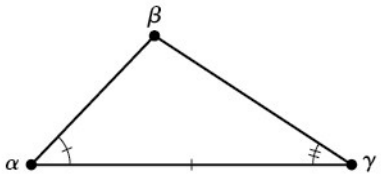
Any triangle that is not a right triangle is an **oblique triangle**.

Definition - Solving a Triangle

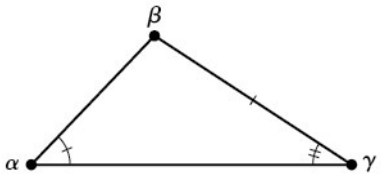
Solving a triangle means finding the measures of all angles and sides given incomplete information.

Types of Triangles for the Law of Sines

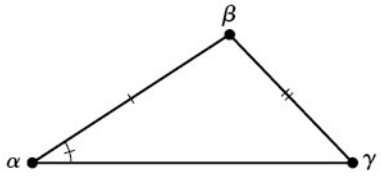
ASA (angle-side-angle)



AAS (angle-angle-side)

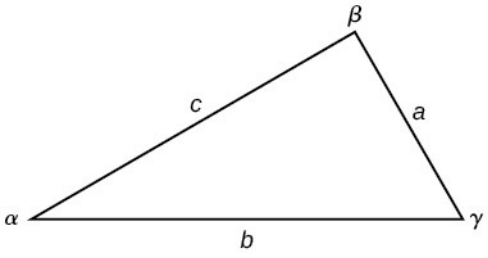


SSA (side-side-angle)



Law of Sines

Fact - Law of Sines



For triangles labeled as the triangle to the right, with angles α, β, and γ, and opposite corresponding sides a, b, and c, respectively, the following proportions are true.

$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$$

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Access for free at https://openstax.org/books/algebra-and-trigonometry-2e/pages/1-introduction-to-prerequisites

Examples

For the following exercises, assume the angles and sides are as in the triangle above. each triangle, if possible. Round each answer to the nearest tenth.

1. $\alpha = 43^\circ, \gamma = 69^\circ, a = 20$

2. $\alpha = 37^\circ, \beta = 49^\circ, c = 5$

You Try It

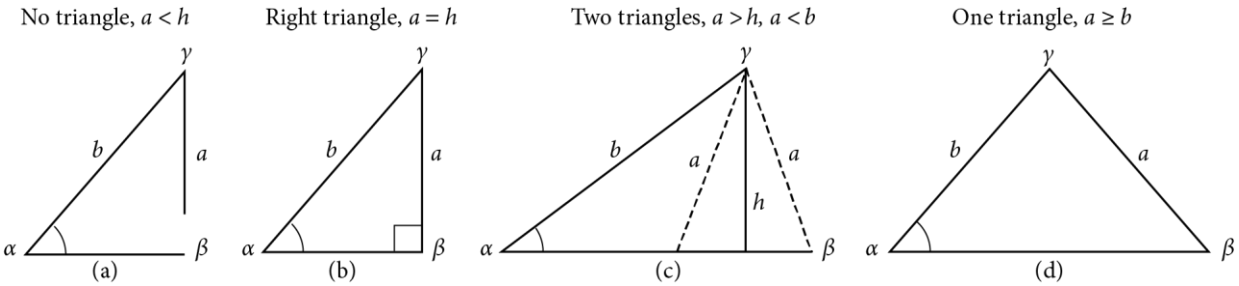
For the following exercises, assume the angles are sides are as in the triangle above. Solve each triangle, if possible. Round each answer to the nearest tenth.

1. $a = 4, \alpha = 60^\circ, \beta = 100^\circ$

2. $\alpha = 132^\circ, \gamma = 23^\circ, b = 10$

The Ambiguous Case

Possible Cases for SSA triangles



Comparison of SSA Triangles

Examples

Determine whether there is no triangle, one triangle, or two triangles. Then solve each triangle, if possible. Round each answer to the nearest tenth.

1. $\gamma = 113°, b = 10, c = 32$

2. $a = 7, c = 9, \alpha = 43.$

3. $\beta = 119°, b = 8.2, a = 11.3.$