

# SOLVING TRIANGLES

**Triangle sum theorem:** The sum of the interior angles of any triangle is  $180^\circ$ .

**Corollary:** The acute angles of a right triangle are complimentary.

**Opposite pairs theorem:** The largest side of a triangle is opposite the largest angle and the smallest side is opposite the smallest angle.

## Special Triangles

### By angles

**45-45-90**

**30-60-90**

### By sides

**3-4-5**

**5-12-13**

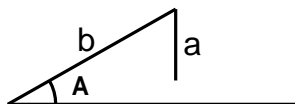
**7-24-25**

Known	To solve...
AAA	Similarity only
SSS SAS	Law of cosines: $c^2 = a^2 + b^2 - 2ab \cos C$
ASA AAS SSA*	Law of sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
Any 4	Law of sines

\*SSA - *The ambiguous case:*

### Acute angle

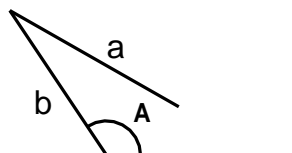
Drawing:



- 1)  $a < b \sin A$   
0 triangles
- 2)  $a = b \sin A$   
1 right triangle
- 3)  $a < b$   
2 triangles
- 4)  $a > b$   
1 triangle

### Obtuse angle

Drawing:



- 1)  $a \leq b$   
0 triangles
- 2)  $a > b$   
1 triangle

### Altitude known

$$A = \frac{1}{2}bh$$

### Area

#### SAS known

$$A = \frac{1}{2}ab \sin C$$

#### SSS known

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

$$s = \frac{1}{2}(a+b+c)$$