

Trigonometry  
Laws of Sines and Cosines

Each of the following triangles needs to be solved, for each triangle do the following:

- sketch a diagram
- determine the nature of the given information and code it as AAS, ASA, SSA, SAS, SSS
- determine the trig rule to be used: Law of Sines or Law of Cosines
- solve for the missing dimensions, if possible, to the nearest tenth; if there are two possible sets of dimensions, give both; if a solution is not possible, state the reason

- 1)  $b = 40, c = 45, A = 51^\circ$   
SAS – Law of Cosines

$$a^2 = 40^2 + 45^2 - 2 \cdot 40 \cdot 45 \cos 51$$

$$a = \mathbf{36.9}$$

$$\frac{36.9}{\sin 51} = \frac{40}{\sin B}$$

$$B = \mathbf{57.5^\circ}$$

$$C = 180 - 51 - 57.5 = \mathbf{71.5^\circ}$$

- 2)  $b = 15.2, A = 12.5^\circ, C = 57.5^\circ$   
ASA – Law of Sines

$$B = 180 - 12.5 - 57.5 = \mathbf{110^\circ}$$

$$\frac{15.2}{\sin 110} = \frac{a}{\sin 12.5}$$

$$a = \mathbf{3.5}$$

$$\frac{15.2}{\sin 110} = \frac{c}{\sin 57.5}$$

$$c = \mathbf{13.6}$$

- 3)  $a = 15, b = 18, c = 20$   
SSS – Law of Cosines

$$20^2 = 15^2 + 18^2 - 2 \cdot 15 \cdot 18 \cos C$$

$$C = \mathbf{74.0^\circ}$$

$$\frac{20}{\sin 74.0} = \frac{15}{\sin A}$$

$$A = \mathbf{46.1^\circ}$$

$$B = \mathbf{59.9^\circ}$$

- 4)  $b = 795.1, c = 775.6, B = 51.8^\circ$   
SSA – Law of Sines  
 $b > c$  *don't need h one solution*

$$\frac{795.1}{\sin 51.8} = \frac{775.6}{\sin C}$$

$$C = \mathbf{50.0^\circ}$$

$$A = \mathbf{78.2^\circ}$$

$$\frac{a}{\sin 78.2} = \frac{795.1}{\sin 51.8}$$

$$a = \mathbf{990.2}$$

- 5)  $a = 20, b = 12, c = 28$   
SSS – Law of Cosines

$$28^2 = 20^2 + 12^2 - 2 \cdot 20 \cdot 12 \cos C$$

$$C = 120.0^\circ$$

$$\frac{28}{\sin 120.0} = \frac{20}{\sin A}$$

$$A = 38.2^\circ$$

$$B = 21.8^\circ$$

- 6)  $a = 125, A = 25^\circ, b = 150$   
SSA - Law of Sines

Find  $h$ !

$$h = 150 \sin 25 = 63.4$$

$a > h$  and  $a < b$  2 solutions

$$\frac{125}{\sin 25} = \frac{150}{\sin B}$$

$$B = 30.5^\circ$$

$$C = 124.5^\circ$$

$$\frac{c}{\sin 124.5} = \frac{125}{\sin 25}$$

$$c = 243.7$$

$$B = 180 - 30.5 = 149.5^\circ$$

$$C = 5.5^\circ$$

$$\frac{c}{\sin 5.5} = \frac{125}{\sin 25}$$

$$c = 28.3$$

- 7)  $a = 10, b = 8, A = 100^\circ$   
SSA – Law of Sines

$A$  is obtuse,  $a > b$  one solution

$$\frac{10}{\sin 100} = \frac{8}{\sin B}$$

$$B = 52.0^\circ$$

$$C = 28.0^\circ$$

$$\frac{10}{\sin 100} = \frac{c}{\sin 28.0}$$

$$c = 4.8$$

- 8)  $a = 27, b = 28, A = 72^\circ$   
SSA – Law of Sines

Find  $h$ !

$$h = 28 \sin 72 = 26.6$$

$a > h$  and  $a < b$  2 solutions

$$\frac{27}{\sin 72} = \frac{28}{\sin B}$$

$$B = 80.5^\circ$$

$$C = 27.5^\circ$$

$$\frac{27}{\sin 72} = \frac{c}{\sin 27.5}$$

$$c = 13.1$$

$$B = 180 - 80.5 = 99.5^\circ$$

$$C = 8.5^\circ$$

$$\frac{27}{\sin 72} = \frac{c}{\sin 8.5}$$

$$c = 4.2$$