

⑦

$$a = ?$$

$$b = 7$$

$$\theta = \frac{\pi}{4}$$

$$R = 10$$



$$R = \frac{1}{2} ab \sin \theta$$

$$10 = \frac{1}{2} a \cdot 7 \sin \frac{\pi}{4}$$

$$\frac{10 \cdot 2}{7 \sin \frac{\pi}{4}} = a$$

$$\frac{20}{7 \frac{1}{\sqrt{2}}} = a$$

$$\frac{20\sqrt{2}}{7} = a$$

$$4.04 \approx a$$

(12)

$$R = \frac{1}{2} a b \sin \theta$$

$$12 = \frac{1}{2} (8)(5) \sin \theta$$

$$\frac{12}{20} = \sin \theta$$

$$\frac{3}{5} = \sin \theta$$

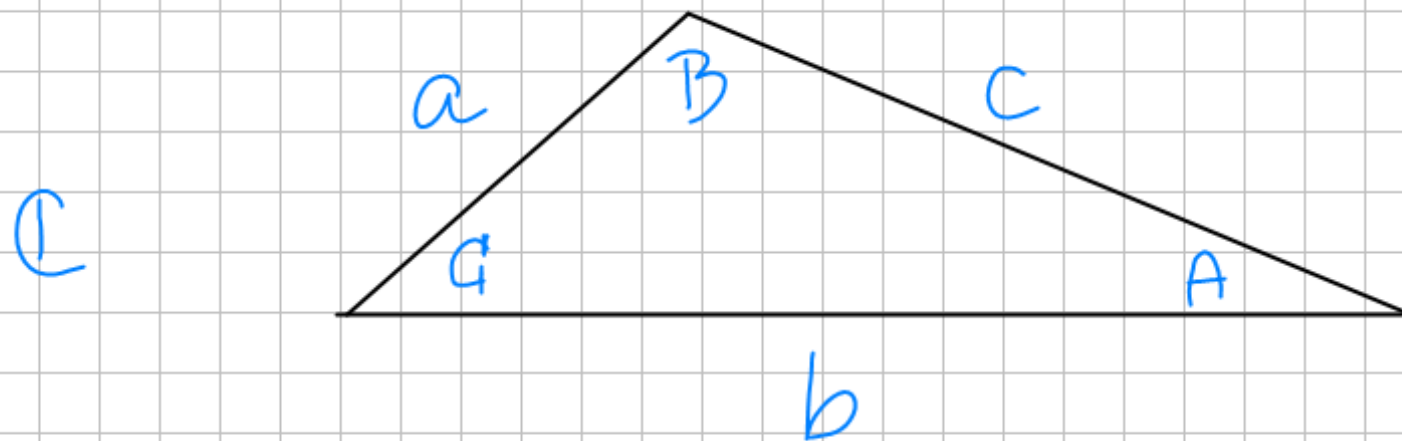
$$\theta = \sin^{-1} \left( \frac{3}{5} \right)$$

$$\theta \approx 36.9^\circ$$

but  $\theta > 90^\circ$

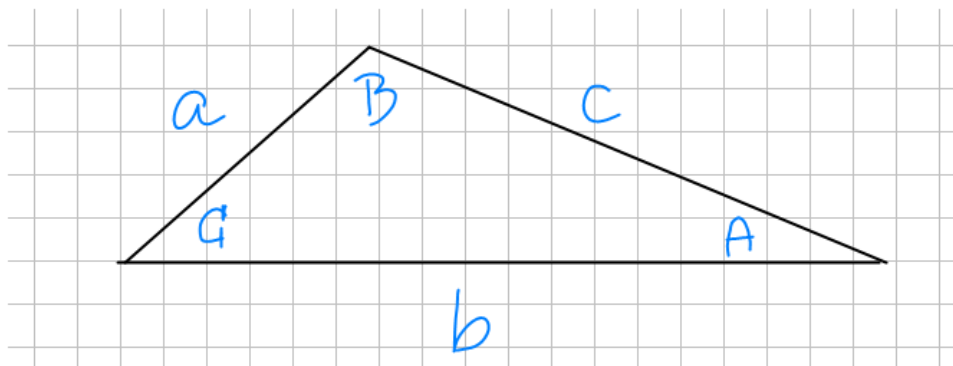
$$\theta = 180 - 36.9^\circ$$

# Law of sines



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



$$R = \frac{1}{2} a b \sin C$$

$$R = \frac{1}{2} b c \sin A$$

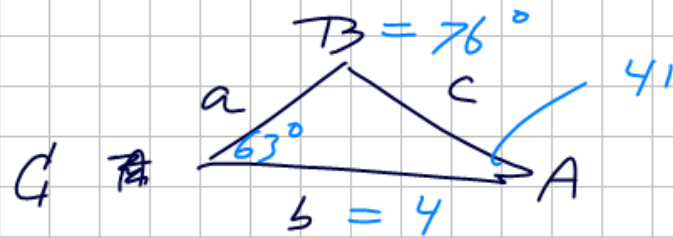
$$R = \frac{1}{2} a c \sin B$$

$$2 \left( \frac{1}{2} a b \sin C = \frac{1}{2} b c \sin A = \frac{1}{2} a c \sin B \right)$$

$$\frac{a b \sin C}{\cancel{b} \cancel{c}} = \frac{\cancel{b} c \sin A}{\cancel{a} \cancel{c}} = \frac{\cancel{a} c \sin B}{\cancel{a} \cancel{c}}$$

$$\frac{\sin C}{c} = \frac{\sin A}{a} = \frac{\sin B}{b}$$

example



Find length of all 3 sides given 2 angles and 1 side.

$$\frac{\sin C}{c} = \frac{\sin B}{b}$$

$$\frac{\sin 63^\circ}{c} = \frac{\sin 76^\circ}{4}$$

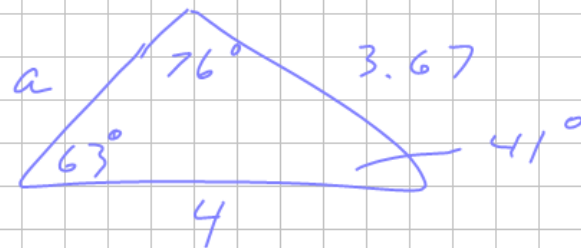
$$c = \frac{4 \sin 63^\circ}{\sin 76^\circ}$$

$$c = 4 \sin(63) / \sin(76)$$

$$c \approx 3.67$$

Find ~~b~~ a:

$$a = 2.70$$



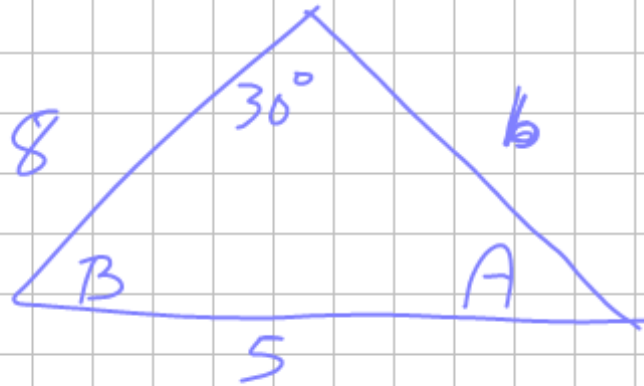
$$\frac{\sin 41^\circ}{a} = \frac{\sin 76^\circ}{4}$$

$$a = \frac{4 \sin 41^\circ}{\sin 76^\circ}$$

$$a = 2.70$$

example

(SSA)



2 different answers

AAS

$$B < 90^\circ,$$

$$B > 90^\circ$$

$$\frac{\sin 30^\circ}{5} =$$

$$\frac{\sin A}{8}$$

