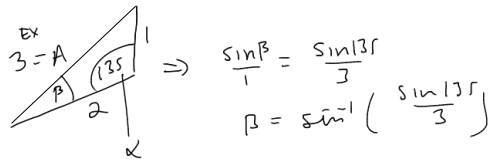
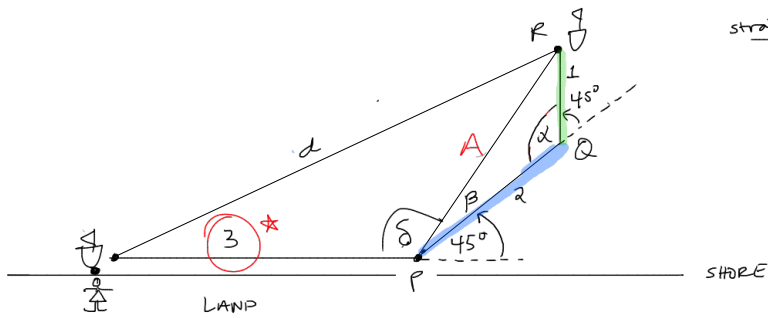


You leave your friend behind on the shore and you travel 3 miles due east in your boat. Then you travel 2 miles northeast. Then you travel 1 mile due north. Your friend can see you at a distance of  miles and at a bearing of  degrees.  
 Enter your answers with at least 3 digits beyond the decimal point.



goal: Find  $d$ .

strategy: create triangle  $\Delta PQR$   
 $\alpha$  is supplementary to  $45^\circ$  ( $180 = \alpha + 45^\circ$ )

$$\alpha = 135^\circ$$

$\Delta PQR$  is SAS triangle  
 (use Law of Cosines)

$$d^2 = 2^2 + 1^2 - 2 \cdot 2 \cdot 1 \cdot \cos(135^\circ)$$

$$d = \dots$$

use geometry to find  $\delta$ .

$$\delta + \beta + 45^\circ = 180^\circ$$

Next: find  $\beta$ .

$$\text{So } \delta = 180 - 45 - \beta$$

(we now know  $\delta$ )

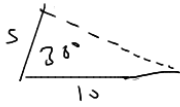
$$d^2 = 3^2 + A^2 - 2 \cdot 3 \cdot A \cdot \cos(\delta)$$

(\*)

# Types of Triangles

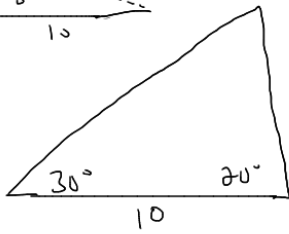
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SAS - side - angle - side



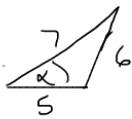
~ Law of Cosines

ASA



~ Law of Sines  
(b/c Law of Cosines requires 2 sides)

SSS -

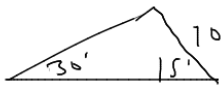


~ Law of Cosines

$$6^2 = 7^2 + 5^2 - 2 \cdot 7 \cdot 5 \cdot \cos \alpha$$

solve for  $\alpha$

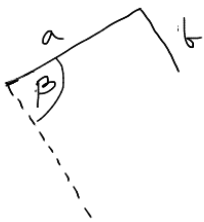
AAS



~ Law of Sines

SAA

ASS



depends on: relationship b/w  
 $a \cdot \cos \beta \neq b$

(if they're =, then it's a right  $\Delta$ )

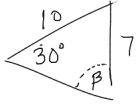
$A = 30^\circ$

$a = 7$

$b = 10$

ASS

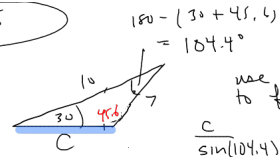
Two SOLS



1. Use Law of Sines to find B.

$$\frac{\sin 30^\circ}{7} = \frac{\sin B}{10}$$

$$\sin^{-1}\left(10 \cdot \frac{\sin 30^\circ}{7}\right) = B \approx 45.6^\circ$$

solve this  $\Delta$ 

use either law to find C

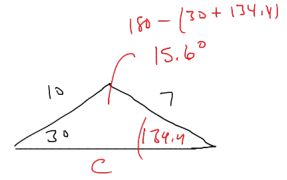
$$\frac{c}{\sin(104.4)} = \frac{10}{\sin(45.6)}$$

$$C = \sin(104.4) \times \frac{10}{\sin(45.6)}$$

Also check supplementary angle ...

to see if it is compatible with the given  $\Delta$ .

AND



$$B' = 180^\circ - 45.6 = 134.4$$

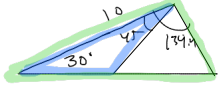
solve this  $\Delta$ 

Is it compatible?

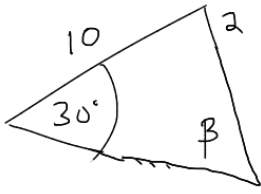
$$134.4 + 30 = 164.4 \quad \text{yes!}$$

$$\frac{c}{\sin(15.6)} = \frac{10}{\sin(134.4)} \quad \text{smaller}$$

$$C = \sin(15.6) \cdot \frac{10}{\sin(134.4)}$$



ASS triangles with no solutions



1. Law of Sines

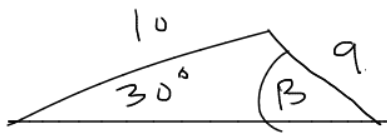
$$\frac{\sin \beta}{10} = \frac{\sin 30}{2}$$

$$\sin \beta = 10 \cdot \frac{\sin(30)}{2}$$

$$= 10 \cdot \frac{\left(\frac{1}{2}\right)}{2} = \frac{5}{2} = 2.5$$

$$\beta = \sin^{-1}(2.5) \quad \underline{\text{DNE}}$$

ASS  $\Delta$  w/ 1 sol'n



ASS  $\Delta \Rightarrow$  L. or Sines

$$\frac{\sin B}{10} = \frac{\sin 30}{9}$$

$$B = \sin^{-1} \left( 10 \cdot \frac{\sin 30}{9} \right)$$

$$= \sin^{-1} \left( \frac{5}{9} \right) \approx 33^\circ$$

check sup. angle

$$180^\circ - 33^\circ = 147^\circ$$

$$\cos(135^\circ + \frac{\pi}{180})$$