Mathematics 10D

8.2 Sine Law

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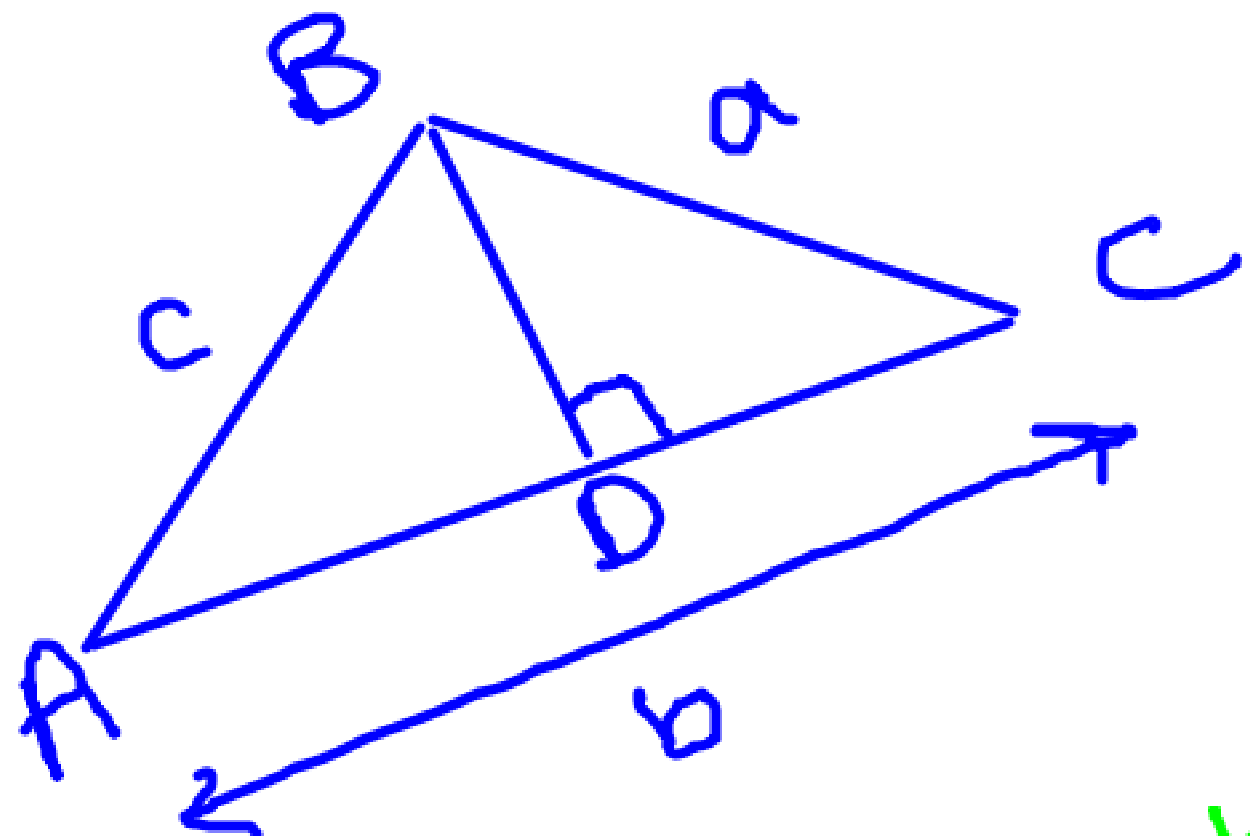
FROM SOH, CAH, TOA

Proof

To Show: The sine law is true for all acute triangles.



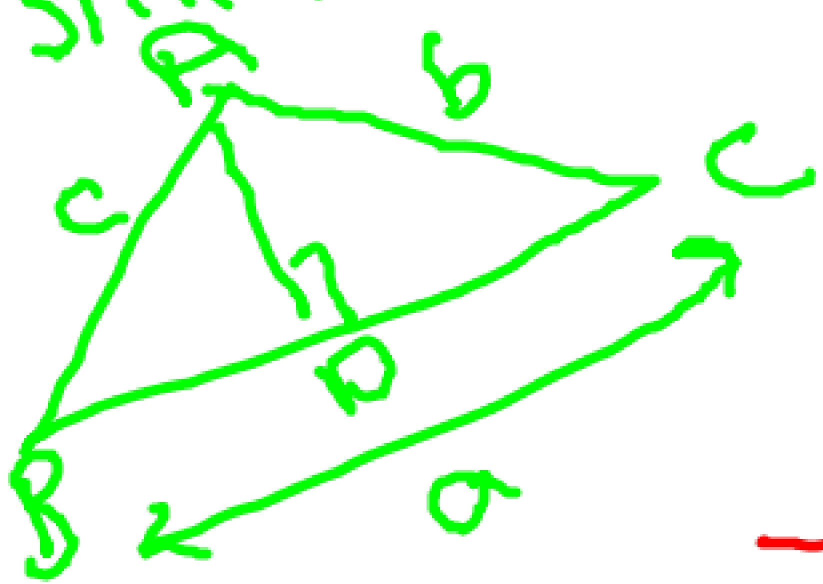
SOH: $c\left(\sin(A)\right) = \left(\frac{BD}{\cancel{c}}\right)\cancel{c}$ $\quad$ $\cancel{a}\sin(C) = \left(\frac{BD}{\cancel{a}}\right)$

$c\sin(A) = \boxed{BD}$ $\quad$ $a\sin(C) = \boxed{BD}$

$$\frac{c\cancel{\sin(A)}}{\cancel{\sin(A)}\sin(C)} = \frac{a\cancel{\sin(C)}}{\sin(A)\cancel{\sin(C)}}$$

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

still need to show $\frac{b}{\sin(B)} =$



$\sin(B) = \frac{AD}{c}$

$\sin(C) = \frac{AD}{b}$

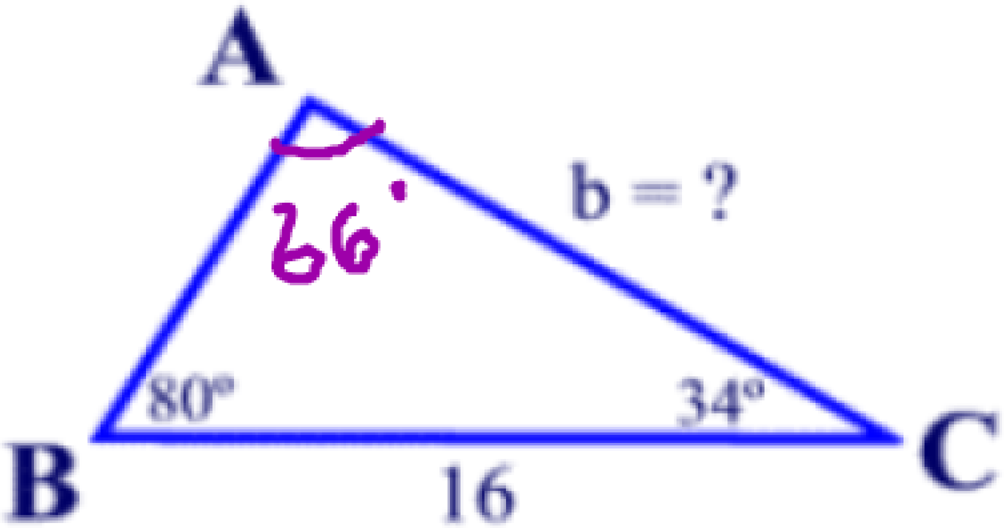
$$\frac{c\cancel{\sin(B)}}{\cancel{\sin(B)}\sin(C)} = \frac{b\cancel{\sin(C)}}{\sin(B)\cancel{\sin(C)}}$$

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

$\therefore$

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

Therefore/Thus the sine law is true..



In $\triangle ABC$, $m\angle B = 80°$, $m\angle C = 34°$ and $a = 16$. Find the length of b ~~to the nearest tenth~~.

Need 3 pieces of info.

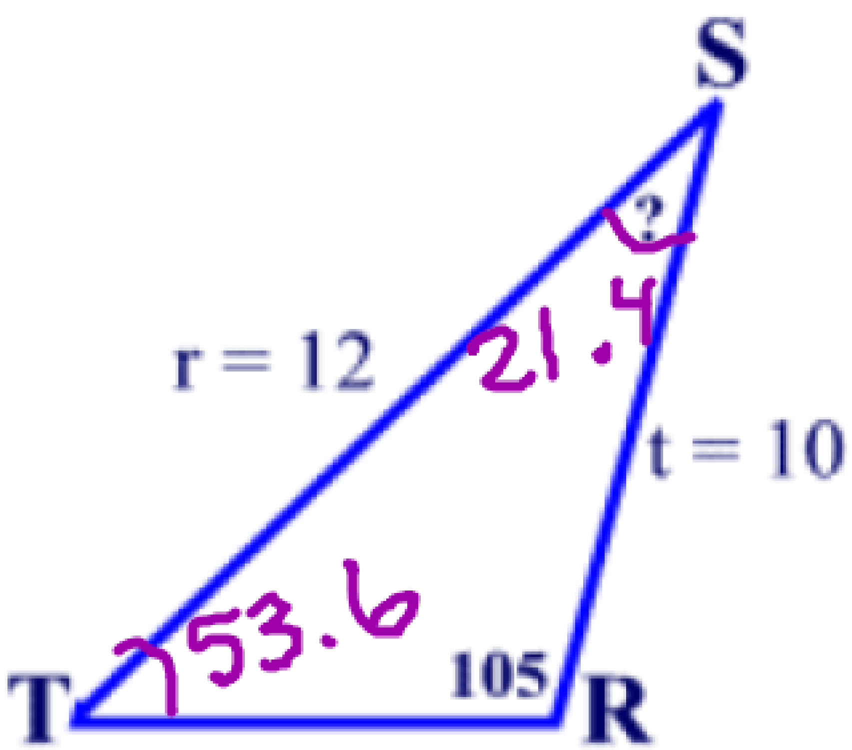
$$\angle A = 180° - 80° - 34°$$
$$\angle A = 100° - 34°$$
$$\angle A = 66°$$

$$\boxed{\frac{a}{\sin(A)} = \frac{b}{\sin(B)}} = \frac{c}{\sin(C)}.$$

$$\sin(80°)\left(\frac{16}{\sin(66°)}\right) = \left(\frac{b}{\sin(80°)}\right)\sin(80°)$$

$$\frac{\sin(80°)16}{\sin(66°)} = b$$

$$17.25 \approx b$$



In $\triangle RST$, $m\angle R = 105^\circ$, $r = 12$, and $t = 10$. Find the $m\angle S$, to *nearest degree*.

$$\frac{TR?}{\sin(S)?} = \frac{r}{\sin(R)} = \frac{t}{\sin(T)?}$$

$$\sin(\angle T)\left(\frac{12}{\sin(105)}\right) = \left(\frac{10}{\cancel{\sin(\angle T)}}\right)\cancel{\sin(\angle T)}$$

$$\frac{\cancel{\sin(105)}}{\cancel{12}}\left(\frac{\sin(\angle T)\cancel{12}}{\cancel{\sin(105)}}\right) = (10)\frac{\sin(105)}{12}$$

$$\sin^{-1}(\sin(\angle T)) = \sin^{-1}\left(\frac{10\sin(105)}{12}\right)$$

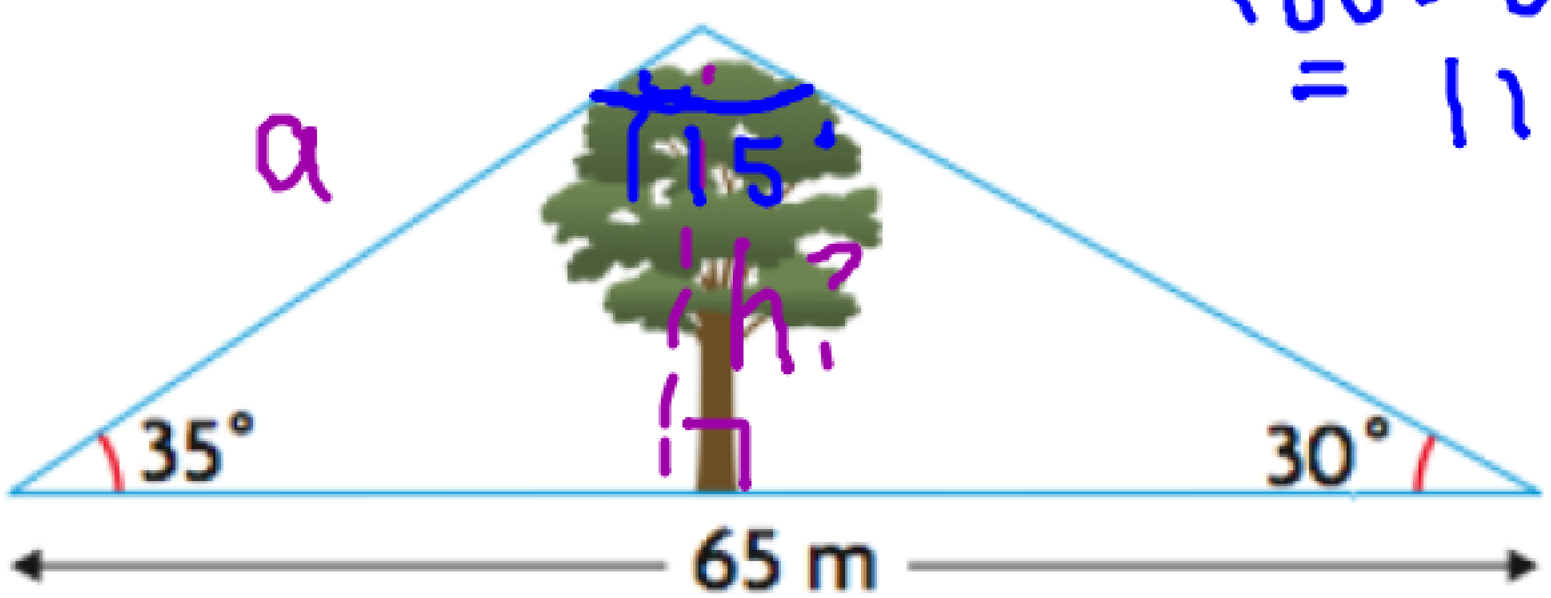
$$\angle T \approx 53.6$$

$$180^\circ - 105^\circ - 53.6^\circ = \angle S$$

$$75^\circ - 53.6^\circ = \angle S$$

$$\boxed{\therefore 21.4^\circ = \angle S}$$

11. Angles were measured from two points on opposite sides of a tree, as shown. How tall is the tree?



$180 - 65 = 115°$

* Very difficult using SOH CAH TOA.

$$\sin(30°)\left(\frac{a}{\sin(30°)}\right) = \left(\frac{65m}{\sin(115°)}\right)\sin(30°)$$

$$a = \frac{\sin(30°)65}{\sin(115°)}$$

$$a = 35.86$$

SOH:

$$a(\sin(35°)) = \left(\frac{h}{a}\right)a$$

$$a\sin(35°) = h$$

$$35.86(\sin(35°)) = h$$

$$20.57 \approx h$$

$\therefore$ the height of the tree is about 20.57m