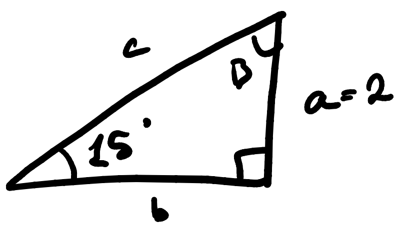
Practice Exam 1 Solutions

Monday, June 21, 2021 1:03 PM

Problem 1

Solve the right triangle ABC with $C = 90°$, $A = 30°$, and $a = 2$.
If a were not given, what could we find?



First find B using

$$A + B + C = 180°$$

$$30° + B + 90° = 180°$$

$$B = 180° - 90° - 30°$$

$$\boxed{B = 60°}$$

Next use SOH CAH TOA:

$$\sin(30°) = \frac{a}{c}$$

from unit circle

$$\frac{1}{2} = \frac{2}{c}$$

Solve for c: multiply both sides by c.

$$\frac{1}{2}c = 2,$$

multiply both sides by 2

$$\boxed{c = 4.}$$

$$\cos(30°) = \frac{b}{c}$$

unit

$\cos(30^\circ) = \frac{\quad}{c}$

unit circle ↳ $\frac{\sqrt{3}}{2} = \frac{b}{4}$ previous result

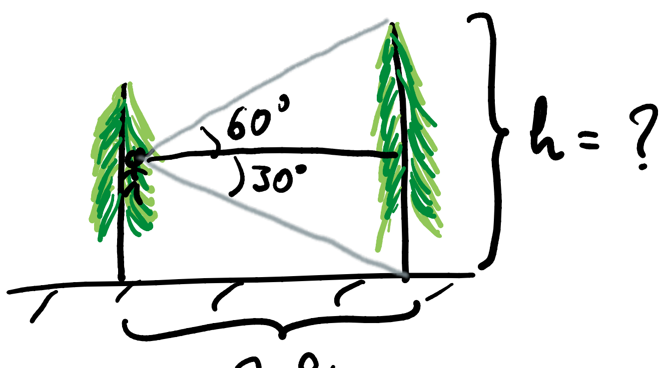
multiply both sides by 4:

$$b = \overset{2}{\cancel{4}} \cdot \frac{\sqrt{3}}{\cancel{2}}$$

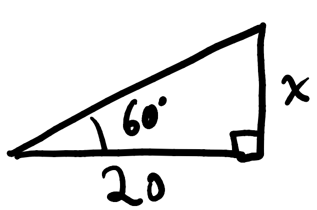
$$\boxed{b = 2\sqrt{3}!}$$

If a were not given, we would only be able to find B. We would not be able to solve for b.

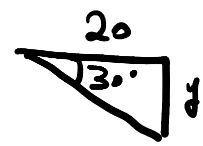
Problem 2.



We will split this up into two triangles:



and



The $h = x + y$

Then $h = x + y$.

In the first triangle, use SOHCAHTOA:

$$\tan(60^\circ) = \frac{x}{20}$$

from unit circle

$$20 \cdot \sqrt{3} = \frac{x}{20} \cdot 20$$

$$\boxed{x = 20\sqrt{3} \text{ ft}}$$

In the second triangle, use SOHCAHTOA again:

$$\tan(30^\circ) = \frac{y}{20}$$

unit circle

$$\frac{1}{\sqrt{3}} = \frac{y}{20}$$

$$\boxed{y = \frac{20}{\sqrt{3}} \text{ ft}}$$

The tree is $h = x + y$

$$\boxed{h = 20\sqrt{3} + \frac{20}{\sqrt{3}} \text{ ft}}$$

tall.

Problem 3.

$$3\sin^2\left(\frac{\pi}{\ }\right) + \cos\left(\frac{\pi}{\ }\right)$$

$$3\sin^2\left(\frac{\pi}{3}\right) + \cos\left(\frac{\pi}{4}\right)$$

Unit circle: $\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$

plug in

$$= 3\left(\frac{\sqrt{3}}{2}\right)^2 + \frac{1}{\sqrt{2}}$$

square top & bottom

$$= 3 \cdot \frac{3}{4} + \frac{1}{\sqrt{2}}$$

$$= \boxed{\frac{9}{4} + \frac{1}{\sqrt{2}}}$$ ← totally acceptable

$$= \frac{9}{4} \cdot \frac{\sqrt{2}}{\sqrt{2}} + \frac{1}{\sqrt{2}} \cdot \frac{4}{4}$$ ← adding the fractions

$$= \boxed{\frac{9\sqrt{2} + 4}{4\sqrt{2}}}$$ ← also acceptable.