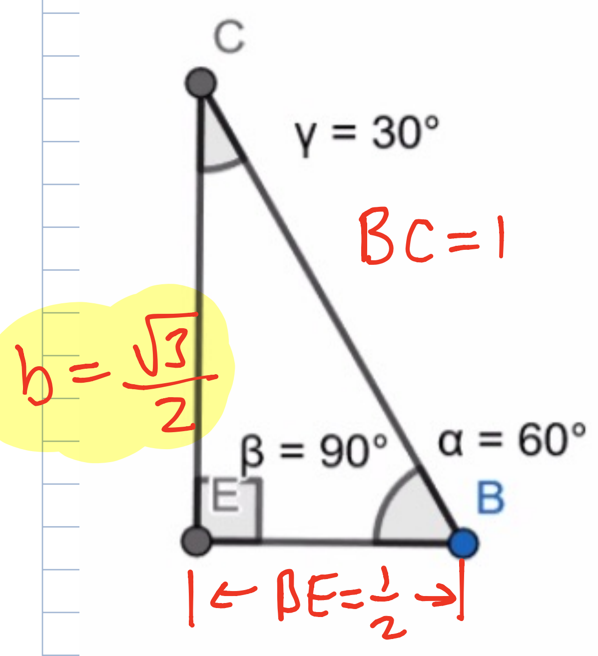

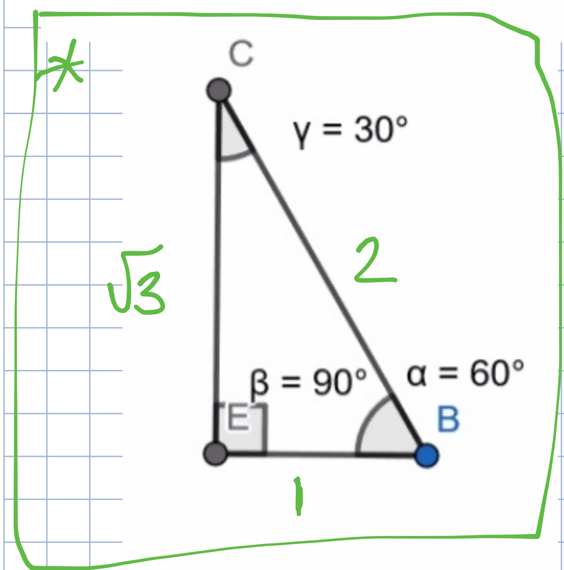

By Pythagorean Theorim

$$a^2 + b^2 = c^2$$

legs — hypotenuse

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

$$\frac{1}{4} + b^2 = \cancel{1}\left(\frac{4}{4}\right)$$

$$-\frac{1}{4} \qquad\qquad -\frac{1}{4}$$

$$b^2 = \frac{3}{4}$$

$$b = \pm\frac{\sqrt{3}}{\sqrt{4}}$$

$$b = \pm\frac{\sqrt{3}}{2}$$

Reject $b = -\frac{\sqrt{3}}{2}$ because length

$$b = \frac{\sqrt{3}}{2}$$

Note: similar triangles are proportional

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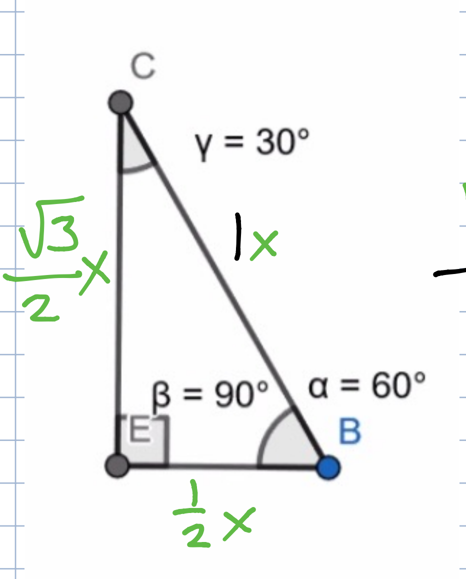
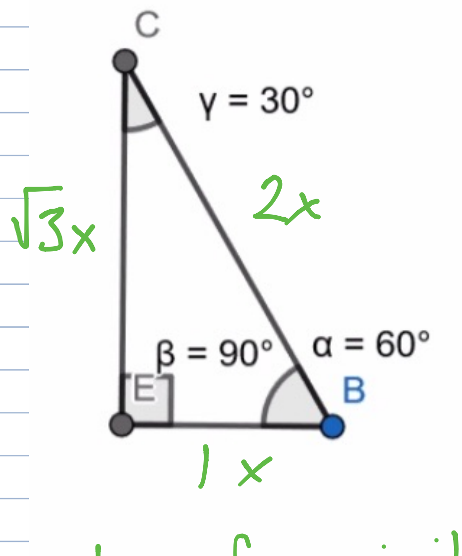
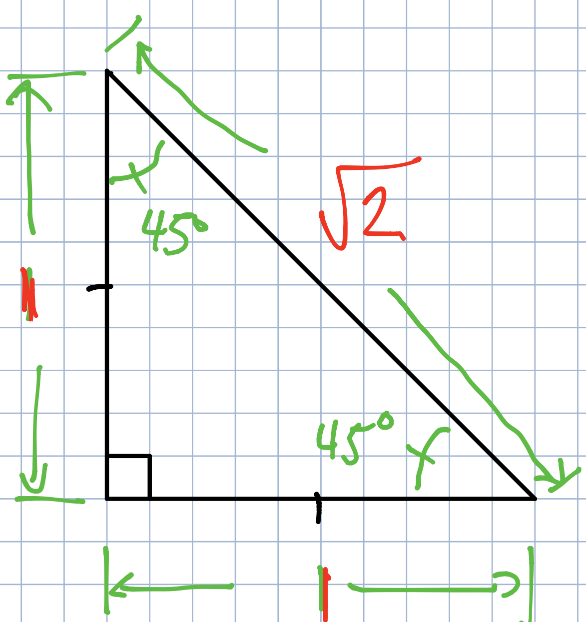


multiply all sides by 2.



The side ratios for similar triangles will always remain the same.

Ratios of 30-60-90△



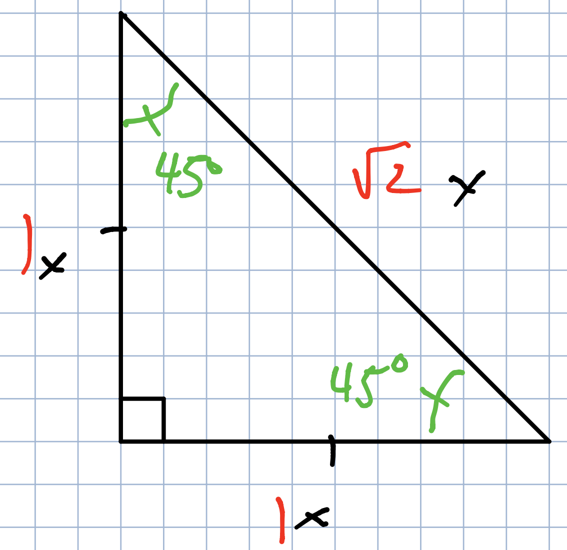
right △

isosceles △ – two sides are congruent

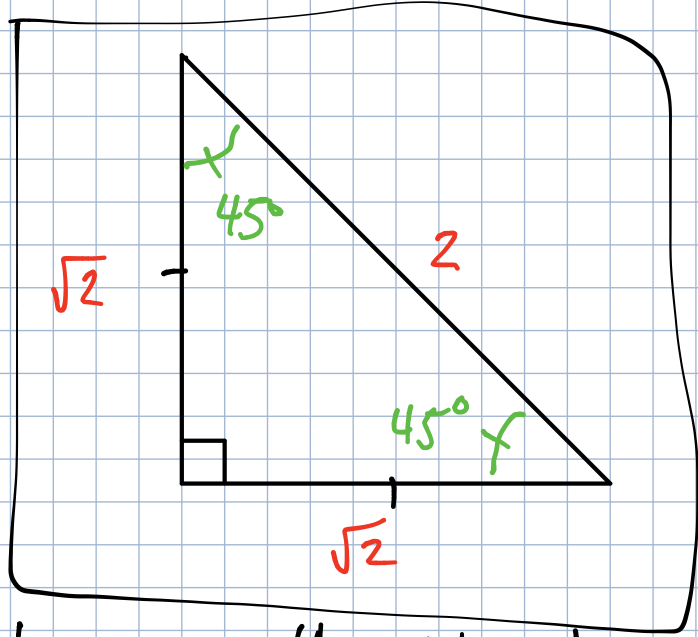
By Pythagorean Theorem

$$a^2+b^2=c^2$$
$$(1)^2+(1)^2=c^2$$
$$1+1=c^2$$
$$2=c^2$$
$$\pm\sqrt{2}=c$$

Reject $c=-\sqrt{2}$

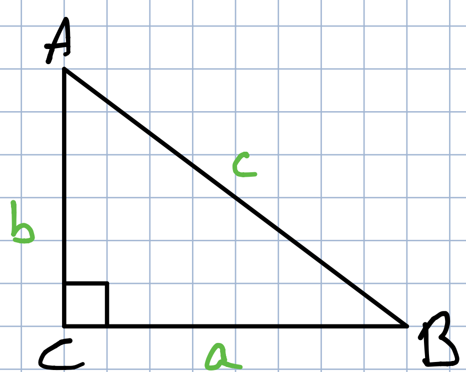


For 45-45-90 △



these are the side ratios

In general, consider a right △



definitions

hypotenuse – the longest side of right △
– opposite right ∡
– in this case side c, $\overline{AB}$

opposite – side not touching the angle in question (NOT THE HYPOTENUSE

– e.g. side b is opposite ∠B
$\overline{AC}$ is opposite ∠B

side a is opposite ∠A

$\overline{BC}$ is opposite $\angle A$

adjacent - side that is touching the angle in question

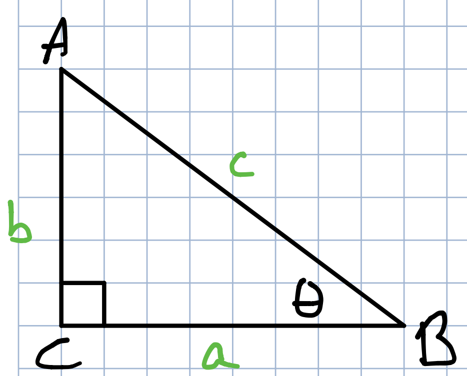
NOT THE HYPOTENUSE

- e.g. $\overline{BC}$ is adjacent to $\angle B$

side a is adjacent to $\angle B$

$\overline{AC}$ is adjacent to $\angle A$

side b is adjacent to $\angle A$



define: Assume $\angle\theta$

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{b}{c} = \frac{AC}{AB}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{a}{c} = \frac{BC}{AB}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{b}{a} = \frac{AC}{BC}$$

$\overline{AC}$ = line $\overline{AC}$

AC = length of AC

"SOH CAH TOA"

$S\frac{O}{H}$ $C\frac{A}{H}$ $T\frac{O}{A}$

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

$$\cos(\angle A) = \frac{b}{c}$$

$$\tan(\angle A) = \frac{a}{b}$$

$$\csc(\angle A) = \frac{c}{a}$$

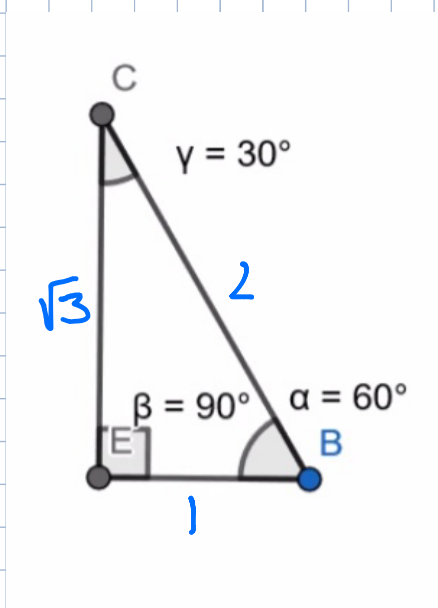
$$\sec(\angle A) = \frac{c}{b}$$

$$\cot(\angle A) = \frac{b}{a}$$

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \csc\theta = \frac{\text{hypotenuse}}{\text{opposite}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} \qquad \cot\theta = \frac{\text{adjacent}}{\text{opposite}}$$



$$\sin(60^\circ) = \frac{\sqrt{3}}{2} \qquad \csc(60^\circ) = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

$$\cos(60^\circ) = \frac{1}{2} \qquad \sec(60^\circ) = \frac{2}{1} = 2$$

$$\tan(60^\circ) = \frac{\sqrt{3}}{1} = \sqrt{3} \qquad \cot(60^\circ) = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$\sin(30^\circ) = \frac{1}{2} \qquad \csc(30^\circ) = \frac{2}{1} = 2$$

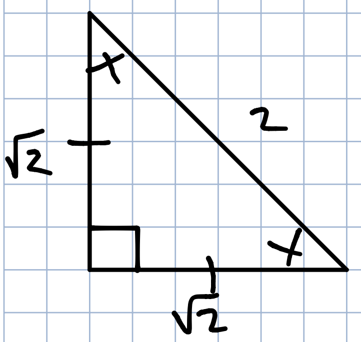
$$\cos(30^\circ) = \frac{\sqrt{3}}{2} \qquad \sec(30^\circ) = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

$$\tan(30^\circ) = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3} \qquad \cot(30^\circ) = \frac{\sqrt{3}}{1} = \sqrt{3}$$

$$\sin(60^\circ) = \cos(30^\circ)$$

$$\sin(30^\circ) = \cos(60^\circ)$$

$$\boxed{\begin{aligned}\cos\theta &= \sin(90-\theta)\\ &= \sin\left(\frac{\pi}{2}-\theta\right)\end{aligned}}$$



$\sin(45^\circ) = \frac{\sqrt{2}}{2}$

$\cos(45^\circ) = \frac{\sqrt{2}}{2}$

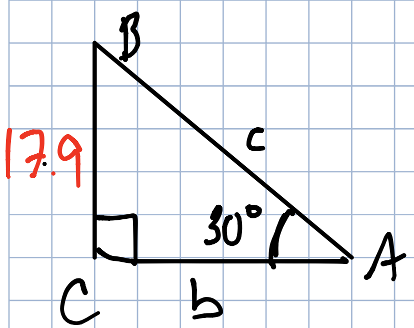
$\tan(45^\circ) = \frac{\sqrt{2}}{\sqrt{2}} = 1$

$\csc(45^\circ) = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

$\sec(45^\circ) = \sqrt{2}$

$\cot(45^\circ) = 1$

Solving Right Δs



Solve for c

side c is hypotenuse

17.9 is opposite of $\angle A$

$m(\angle A) = 30^\circ$

$\rightarrow \sin(\angle A) = \frac{opp}{hyp}$

$\frac{\sin(30^\circ)}{1} = \frac{17.9}{c}$

$c \cdot \sin(30^\circ) = 17.9$

$\frac{c \cancel{\sin(30^\circ)}}{\cancel{\sin(30^\circ)}} = \frac{17.9}{\sin(30^\circ)}$

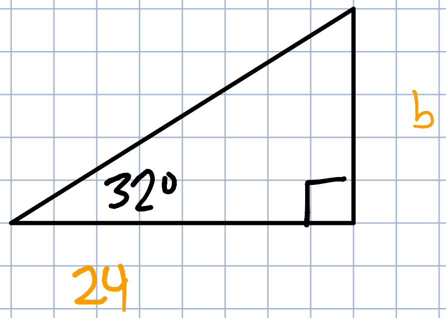
$c = \frac{17.9}{\sin(30^\circ)}$

* Note: in this case, we know $\sin(30^\circ) = \frac{1}{2}$

* Only do this if angle is a special angle 0, 30, 45, 60, 90,

$c = \frac{17.9}{\left(\frac{1}{2}\right)}$

$c = 17.9\left(\frac{2}{1}\right) = 35.8$



Find b

Given: 32°

b is opposite

24 is adjacent

$\rightarrow \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

$$\frac{\tan(32^\circ)}{1} = \frac{b}{24}$$

$$24 \cdot \tan(32) = b$$

* Note: We don't know tan(32), use a calculator

* Calculator is set to DEGREES
NOT RADIANS

$$24 \cdot \tan(32) = b$$

$$b \approx 38.41$$