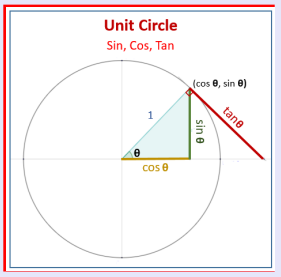
Trigonometry

Lecture 15



Feb 19-8:47 AM

Verify $\cos x \tan x = \sin x$ ✓

$\cos x \cdot \tan x = \cos x \cdot \frac{\sin x}{\cos x}$

$= \sin x$ ✓

Verify $\frac{\cos x}{1+\sin x} - \frac{1-\sin x}{\cos x} = 0$

$\frac{\cos x}{1+\sin x} \cdot \frac{\cos x}{\cos x} - \frac{1-\sin x}{\cos x} \cdot \frac{1+\sin x}{1+\sin x}$

$= \frac{\cos^2 x - (\overbrace{1-\sin x)(1+\sin x}^{A-B \quad A+B})}{(1+\sin x)\cos x} =$

$= \frac{\cos^2 x - (1 - \overbrace{\sin^2 x}^{A^2-B^2})}{(1+\sin x)\cos x} = \frac{\cos^2 x - 1 + \sin^2 x}{(1+\sin x)\cos x}$ (1 − 1)

$= \frac{0}{(1+\sin x)\cos x} = \boxed{0}$

Sep 19-10:27 AM

Verify $\dfrac{\cos x + 1}{\cot x} = \sin x + \tan x$

$\dfrac{\cos x + 1}{\cot x} = \dfrac{\cos x}{\cot x} + \dfrac{1}{\cot x}$

$= \cos x \cdot \dfrac{1}{\cot x} + \dfrac{1}{\cot x}$

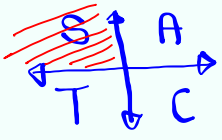
$= \cos x \cdot \tan x + \tan x$

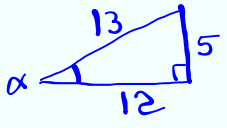
$= \cancel{\cos x} \cdot \dfrac{\sin x}{\cancel{\cos x}} + \tan x$

$= \sin x + \tan x$

Sep 19-10:36 AM

$\sin \alpha = \dfrac{5}{13}$, α is in QII, find





$\sin(-\alpha) = -\sin\alpha = \dfrac{-5}{13}$ $\quad \csc(-\alpha) = \dfrac{-13}{5}$

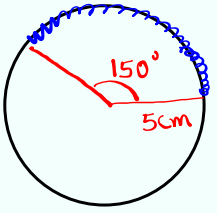
$\cos(-\alpha) = \cos\alpha = -\dfrac{12}{13}$ $\quad \sec(-\alpha) = \dfrac{-13}{12}$

$\tan(-\alpha) = -\tan\alpha = -\dfrac{-5}{12}$ $\quad \cot(-\alpha) = \dfrac{12}{5}$

$= \dfrac{5}{12}$

Sep 19-10:41 AM

Find area & arc length of a sector with radius 5cm and central angle of 150°.



$180^\circ = \pi$

$1^\circ = \frac{\pi}{180}$

$150^\circ = \frac{150\pi}{180} = \frac{5\pi}{6}$

$150^\circ = \frac{5\pi}{6}$

$A = \frac{1}{2} r^2 \theta$

$= \frac{1}{2} \cdot 5^2 \cdot \frac{5\pi}{6}$

$= \frac{125\pi}{12}\ cm^2$

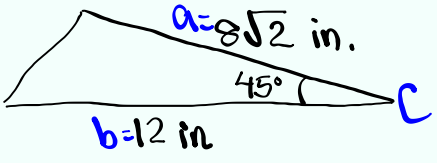
θ has to be in radians

$S = r\theta$

$= 5 \cdot \frac{5\pi}{6} = \frac{25\pi}{6}\ cm$

Sep 19-10:46 AM

Find the area of the triangle below



$Area = \frac{1}{2} ab \sin C$

$Area = \frac{1}{2} \cdot 12 \cdot 8\sqrt{2} \cdot \sin 45^\circ$

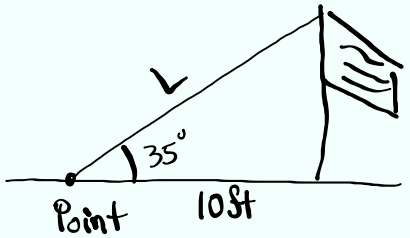
$= \frac{1}{2} \cdot \overset{6}{\cancel{12}} \cdot 8\sqrt{2} \cdot \frac{\sqrt{2}}{2}$

$= 48\ in^2$

Sep 19-10:51 AM

A wire connects a point on the ground to the top of a standing flag.

The angle of elevation is 35°. Point is 10 ft from the flag. Find length of wire.



$\cos 35° = \frac{10}{L}$

$L \cos 35° = 10$

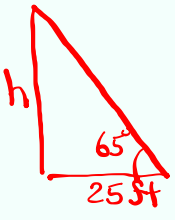
$L = \frac{10}{\cos 35°} \approx$ **12 ft**

Sep 19-10:54 AM

Angle of depression from the top of a building to the bottom of another building is 65°.

Two buildings are 25 ft apart.

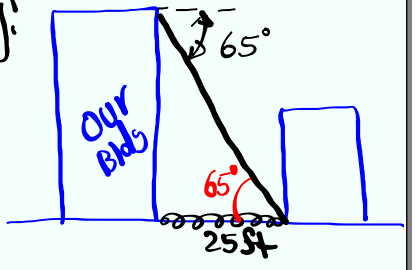
How tall is our building?



$\tan 65° = \frac{h}{25}$

$h = 25 \tan 65°$

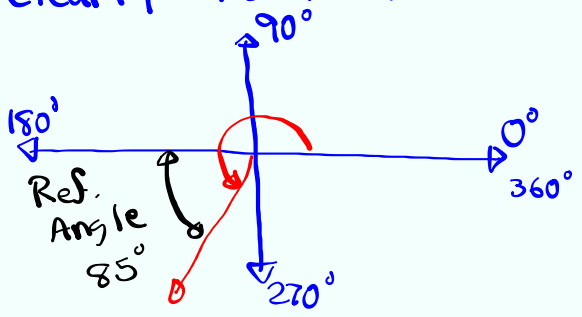
$h \approx 54$ ft



Sep 19-11:00 AM

Draw 265° in Standard Position.

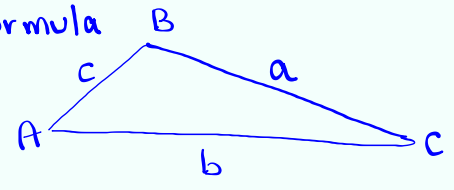
Clearly Mark its Ref. angle.



$265° - 180° = 85°$

Sep 19-11:06 AM

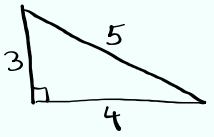
Heron's formula



$S = \frac{a+b+c}{2}$

Heron's formula

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$$



$A = \frac{1}{2}bh$

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

$= 6 \text{ units}^2$

$S = \frac{a+b+c}{2} = \frac{3+4+5}{2} = \frac{12}{2} = 6$

$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$

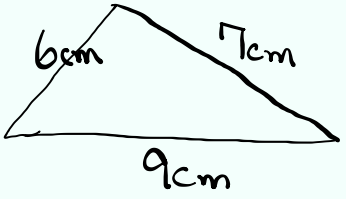
$= \sqrt{6(6-3)(6-4)(6-5)}$

$= \sqrt{6 \cdot 3 \cdot 2 \cdot 1} = \sqrt{36} = 6$

Sep 19-11:09 AM

Find area of triangle below

we have only 3 sides



Heron's formula

$$s = \frac{a+b+c}{2} = \frac{7+9+6}{2} = \frac{22}{2} = 11$$

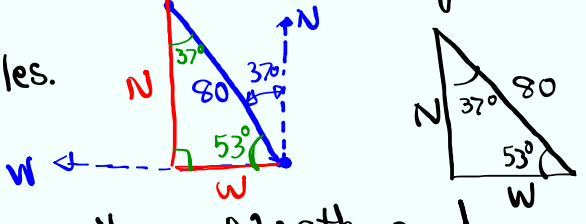
$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{11(11-9)(11-7)(11-6)}$$

$$= \sqrt{11 \cdot 2 \cdot 4 \cdot 5} = \sqrt{440} \approx 21 \text{ cm}^2$$

Sep 19-11:14 AM

A boat travels with bearing N 37° W for 80 miles.



How many miles North and how many miles West has the boat traveled?

$$\sin 53^\circ = \frac{N}{80}$$

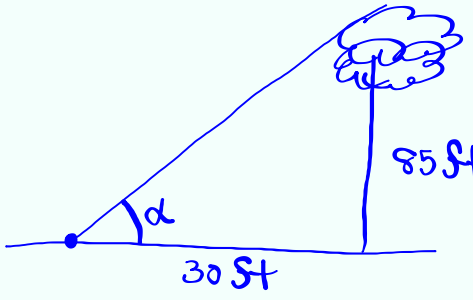
$$N = 80 \cdot \sin 53^\circ \approx 64 \text{ miles}$$

$$\cos 53^\circ = \frac{W}{80}$$

$$W = 80 \cos 53^\circ \approx 48 \text{ miles}$$

Sep 19-11:19 AM

What is the angle elevation from a point 30 ft from a 85 ft-tall tree?



$\tan\alpha = \frac{85}{30}$

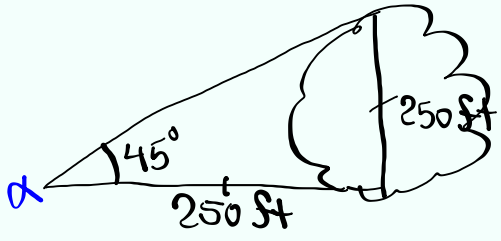
$\alpha = \tan^{-1}\frac{85}{30}$

$\alpha \approx 71^\circ$

Sep 19-11:26 AM

A hill is 250 ft tall. A surveyor is 250 ft from the hill. Find his angle of elevation to the top of hill.

$\tan\alpha = \frac{250}{250} = 1$



$\alpha = \tan^{-1} 1$

$\boxed{\alpha = 45^\circ}$

NO class Monday

Sep 19-11:30 AM