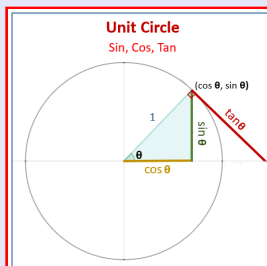


# Trigonometry

## Lecture 12



Feb 19-8:47 AM

Verify

$$\cos x (\csc x + \tan x) = \cot x + \sin x \quad \checkmark$$

$$\cos x (\csc x + \tan x) = \cos x \left( \frac{1}{\sin x} + \frac{\sin x}{\cos x} \right)$$

$$= \frac{\cos x}{\sin x} + \cancel{\cos x} \cdot \frac{\sin x}{\cancel{\cos x}}$$

$$= \cot x + \sin x \quad \checkmark$$

Sep 16-10:29 AM

Simplify

$$\sin^2 x (\cot^2 x + 1) =$$

$$\sin^2 x \cdot \csc^2 x =$$

$$\cancel{\sin^2 x} \cdot \frac{1}{\cancel{\sin^2 x}} =$$

$$\boxed{1}$$

$$\csc x = \frac{1}{\sin x}$$

$$\csc^2 x = \frac{1}{\sin^2 x}$$

Simplify

$$\sec^2 x - \tan^2 x =$$

$$1 + \cancel{\tan^2 x} - \cancel{\tan^2 x} = 1$$

Sep 16-10:33 AM

$$\text{Verify } \frac{1}{1+\cos x} + \frac{1}{1-\cos x} = 2 \csc^2 x \checkmark$$

$$\frac{1(1-\cos x)}{(1+\cos x)(1-\cos x)} + \frac{1(1+\cos x)}{(1-\cos x)(1+\cos x)}$$

$$= \frac{1 - \cancel{\cos x} + 1 + \cancel{\cos x}}{(1+\cos x)(1-\cos x)} = \frac{2}{1 - \cos^2 x}$$

$$= \frac{2}{\sin^2 x} = 2 \cdot \frac{1}{\sin^2 x} = \boxed{2 \csc^2 x}$$

Sep 16-10:41 AM

Verify  $\frac{\csc x - 1}{\csc x + 1} = \frac{1 - \sin x}{1 + \sin x}$  ✓

Convert  $\csc x$  to  $\sin x$

use LCD to clear fractions.

$$\frac{\csc x - 1}{\csc x + 1} = \frac{\frac{1}{\sin x} - 1}{\frac{1}{\sin x} + 1} = \frac{\cancel{\sin x} \cdot \frac{1}{\cancel{\sin x}} - \sin x \cdot 1}{\cancel{\sin x} \cdot \frac{1}{\cancel{\sin x}} + \sin x \cdot 1}$$

Multiply by  $\sin x$

$$= \frac{1 - \sin x}{1 + \sin x}$$

Sep 16-10:46 AM

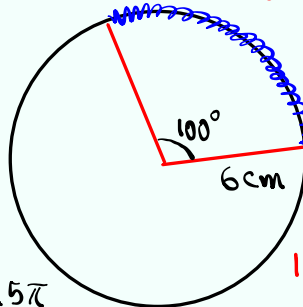
Draw a Sector with central angle  $100^\circ$   
and radius 6 cm.

Find Area

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

$$= \frac{1}{2} (6)^2 \cdot \frac{5\pi}{9} = \frac{1}{2} \cdot 36 \cdot \frac{5\pi}{9}$$

$$= 10\pi \text{ cm}^2$$



$$100^\circ = ? \text{ Rad.}$$

$$180^\circ = \pi \text{ Rad}$$

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

$$100^\circ = \frac{100\pi}{180}$$

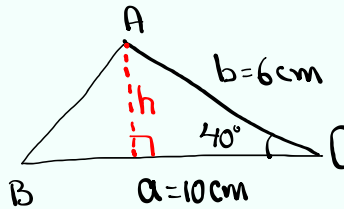
$$= \frac{5\pi}{9}$$

Find arc length

$$S = r\theta = 6 \cdot \frac{5\pi}{9} = \frac{10\pi}{3} \text{ cm}$$

Sep 16-10:51 AM

Draw triangle ABC with  $a=10\text{cm}$ ,  $b=6\text{cm}$ ,  
and  $C=40^\circ$ .



$$\sin 40^\circ = \frac{h}{6}$$

$$h = 6 \cdot \sin 40^\circ$$

Find its Area

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

$$= \frac{1}{2} \cdot 10 \cdot 6 \sin 40^\circ$$

$$= 30 \sin 40^\circ$$

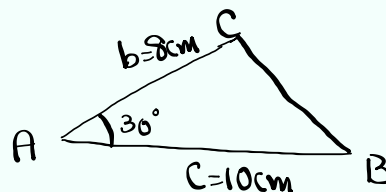
$$= 19.284$$

$$\approx \boxed{19 \text{ cm}^2}$$

Sep 16-10:57 AM

Draw triangle ABC with  $A=30^\circ$ ,  $b=8\text{cm}$ ,  
and  $C=10\text{cm}$ .

Find its area.



Two sides & angle between them SAS

$$\text{Area} = \frac{1}{2} bc \sin A = \frac{1}{2} \cdot 8 \cdot 10 \cdot \sin 30^\circ$$

$$= \frac{1}{2} \cdot \overset{4}{\cancel{8}} \cdot \overset{5}{\cancel{10}} \cdot \frac{1}{2}$$

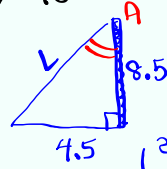
$$= \boxed{20 \text{ cm}^2}$$

Sep 16-11:02 AM

A ladder is leaning against a wall.

It touches the wall 8.5 ft above the ground.

The bottom of the ladder is 4.5 ft from the wall.



1) Draw & label.

2) Find length of the ladder  $L^2 = 4.5^2 + 8.5^2$   
 $L = \sqrt{92.5} \approx \boxed{9.6 \text{ ft}}$   $= 92.5$

3) Find the angle between the wall & ladder?

$$\tan A = \frac{4.5}{8.5} \quad A = \tan^{-1}\left(\frac{4.5}{8.5}\right) \approx 28^\circ$$

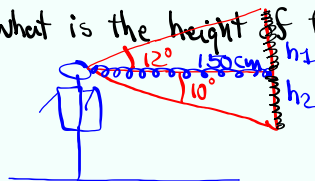
Sep 16-11:06 AM

Alejandro is 150 cm from a mirror on the wall.

Angle of elevation to the top of mirror is  $12^\circ$ .

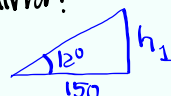
" " depression " " bottom " " is  $10^\circ$ .

What is the height of the mirror?



$$\tan 10^\circ = \frac{h_2}{150}$$

$$h_2 = 150 \cdot \tan 10^\circ$$



$$\tan 12^\circ = \frac{h_1}{150}$$

$$h_1 = 150 \cdot \tan 12^\circ$$

$$h = h_1 + h_2$$

$$= 150 \tan 12^\circ + 150 \tan 10^\circ$$

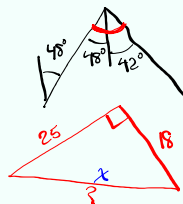
$$\approx \boxed{58 \text{ cm}}$$

Sep 16-11:15 AM

A boat travels 25 miles with bearing of  $48^\circ$ .

It changed direction with bearing of  $S 42^\circ E$  for 18 miles.

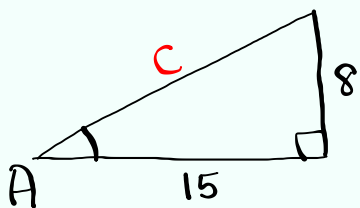
How far is the boat from the original location?



$$\begin{aligned}x^2 &= 25^2 + 18^2 \\ &= 625 + 324 \\ &= 949 \quad x = \sqrt{949} \\ x &\approx 31 \text{ miles}\end{aligned}$$

Sep 16-11:22 AM

Given



class Quiz 3

1) find the hypotenuse

$$\begin{aligned}C^2 &= 8^2 + 15^2 \\ &= 64 + 225 \\ &= 289\end{aligned}$$

$$C = 17$$

2) find

$$\sin A = \frac{8}{17}$$

Sep 16-11:31 AM