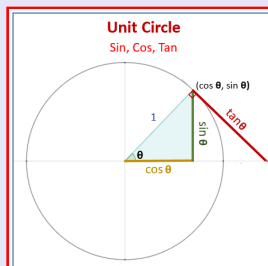


Trigonometry

Lecture 25



Feb 19-8:47 AM

Convert $\frac{4\pi}{3}$ & -1.3 Radians to degrees.

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

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

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

$$\frac{4\pi}{3} \cdot \frac{180^\circ}{\pi} = \frac{4 \cdot 180^\circ}{3}$$

$$= 4 \cdot 60^\circ$$

$$= 240^\circ$$

$$\frac{4\pi}{3} = 4 \left(\frac{\pi}{3} \right) = 4 \cdot 60^\circ = 240^\circ$$

$$-1.3 = -1.3 \cdot \frac{180}{\pi} \approx -75^\circ$$

Oct 10-10:44 AM

find exact value for

a) $\sin 405^\circ$
 $\sin 405^\circ = \sin 45^\circ = \frac{\sqrt{2}}{2}$

b) $\tan(-150^\circ)$
 $= + \tan 30^\circ = \frac{\sqrt{3}}{3}$

c) $\sec \frac{5\pi}{3}$
 $\frac{5\pi}{3} = 5 \cdot 60^\circ = 300^\circ$
 $\sec \frac{5\pi}{3} = \sec \frac{\pi}{3} = \frac{1}{\cos \frac{\pi}{3}} = \frac{1}{\frac{1}{2}} = 2$

The first diagram shows a coordinate plane with a red circle around the origin. A red line is drawn at a 45-degree angle in the first quadrant, labeled 'R.A. 45°'. A red arrow indicates a counter-clockwise rotation from the positive x-axis to 360 degrees.

The second diagram shows a coordinate plane with a red line in the third quadrant, labeled 'R.A. 30°'. A red arrow indicates a clockwise rotation from the positive x-axis to -150 degrees.

The third diagram shows a coordinate plane with a red line in the fourth quadrant, labeled 'R.A. 60° = π/3'. A red arrow indicates a clockwise rotation from the positive x-axis to 5π/3.

Oct 10-10:49 AM

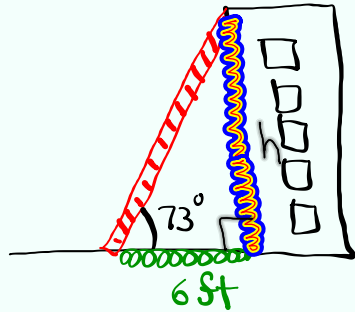
find $\tan \theta + \sin \theta$ given

$2^2 + 3^2 = x^2$
 $4 + 9 = x^2$ $x^2 = 13$
 $x = \sqrt{13}$

$\tan \theta + \sin \theta$
 $\frac{2}{3} + \frac{2}{\sqrt{13}} = \frac{2\sqrt{13} + 6}{3\sqrt{13}}$

Oct 10-10:54 AM

Find the height of the building below



$$\tan 73^\circ = \frac{h}{6}$$

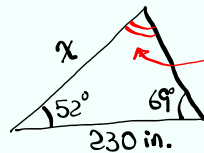
Cross-Multiply

$$h = 6 \cdot \tan 73^\circ$$

$$h \approx 19.6 \text{ ft} \approx 20 \text{ ft}$$

Oct 10-10:58 AM

Find x



$$52^\circ + 69^\circ = 121^\circ$$

$$180^\circ - 121^\circ = 59^\circ$$

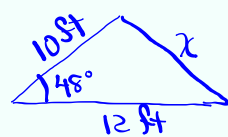
Law of Sines

$$\frac{\sin 59^\circ}{230} = \frac{\sin 69^\circ}{x}$$

$$x \sin 59^\circ = 230 \sin 69^\circ$$

$$x = \frac{230 \sin 69^\circ}{\sin 59^\circ} \quad \boxed{x \approx 251 \text{ in.}}$$

Find x



SAS

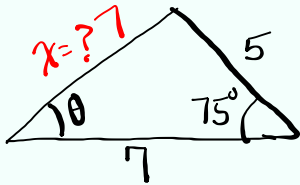
Use Law of Cosines

$$x^2 = 10^2 + 12^2 - 2 \cdot 10 \cdot 12 \cdot \cos 48^\circ$$

$$x^2 = 83.409$$

$$x \approx \sqrt{83.409} \approx \boxed{9 \text{ ft}}$$

Oct 10-11:01 AM

Find angle θ 

$$x^2 = 5^2 + 7^2 - 2 \cdot 5 \cdot 7 \cdot \cos 75^\circ$$

$$x^2 = 25 + 49 - 70 \cos 75^\circ$$

$$x^2 = 55.883$$

$$x \approx \sqrt{55.883} \approx 7$$

$$\frac{\sin \theta}{5} = \frac{\sin 75^\circ}{7}$$

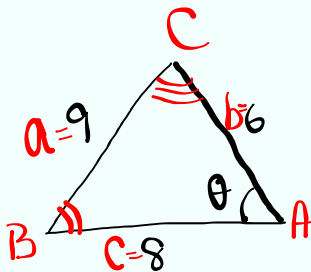
$$7 \sin \theta = 5 \sin 75^\circ$$

$$\sin \theta = \frac{5 \sin 75^\circ}{7}$$

$$\sin \theta \approx .69$$

$$\theta = \sin^{-1}(.69) \approx 44^\circ$$

Oct 10-11:07 AM

Find θ 

Law of Cosine

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$2bc \cos A = b^2 + c^2 - a^2$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

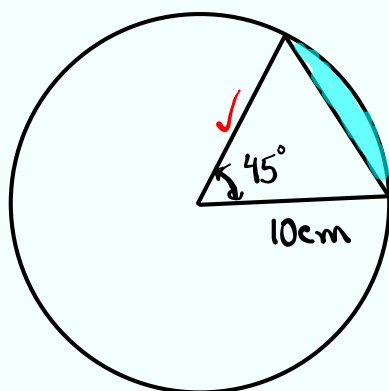
$$\cos A = \frac{6^2 + 8^2 - 9^2}{2(6)(8)}$$

$$\cos A \approx .198$$

$$A \approx \cos^{-1}(.198) \approx 79^\circ$$

Oct 10-11:13 AM

Find the shaded area



Area Sector - A triangle

$$\begin{aligned} \text{Sector } \frac{1}{2} r^2 \theta & \quad \text{triangle} \\ \frac{1}{2} \cdot 10^2 \cdot \frac{\pi}{4} & \quad = \frac{1}{2} \cdot 10 \cdot 10 \cdot \sin 45^\circ \\ = \frac{100\pi}{8} & \quad = \frac{1}{2} \cdot 10 \cdot 10 \cdot \frac{\sqrt{2}}{2} \\ = \frac{25\pi}{2} & \quad = 25\sqrt{2} \end{aligned}$$

Ans. $\left(\frac{25\pi}{2} - 25\sqrt{2} \right) \text{cm}^2$

Oct 10-11:18 AM

Find exact value of $\tan \frac{\pi}{12}$

$$\frac{\pi}{12} = 15^\circ$$

$$15^\circ = 45^\circ - 30^\circ$$

$$\frac{\pi}{12} = \frac{\pi}{6} - \frac{\pi}{6} = \frac{30^\circ}{2} = 15^\circ$$

$$\tan 15^\circ = \tan(45^\circ - 30^\circ)$$

$$\begin{aligned} &= \frac{\tan 45^\circ - \tan 30^\circ}{1 + \tan 45^\circ \tan 30^\circ} \\ &= \frac{1 - \frac{\sqrt{3}}{3}}{1 + \frac{\sqrt{3}}{3}} = \frac{3 - \sqrt{3}}{3 + \sqrt{3}} \end{aligned}$$

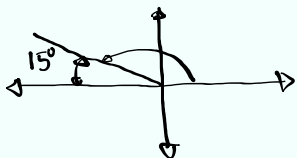
$$\frac{3 - \sqrt{3}}{3 + \sqrt{3}} \cdot \frac{3 - \sqrt{3}}{3 - \sqrt{3}}$$

$$= \frac{9 - 3\sqrt{3} - 3\sqrt{3} + \sqrt{9}}{9 - 3\sqrt{3} + 3\sqrt{3} - \sqrt{9}} = \frac{12 - 6\sqrt{3}}{6} = \frac{6(2 - \sqrt{3})}{6} = \boxed{2 - \sqrt{3}}$$

Oct 10-11:23 AM

Find exact value of $\cos \frac{11\pi}{12}$

$$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165^\circ \quad \cos \frac{11\pi}{12} = -\cos 15^\circ$$



$$15^\circ = 45^\circ - 30^\circ$$

$$\cos 15^\circ = \cos(45^\circ - 30^\circ)$$

$$= \cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ$$

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

$$\cos 15^\circ = \frac{\sqrt{6} + \sqrt{2}}{4}$$

$$\boxed{\cos \frac{11\pi}{12} = -\frac{\sqrt{6} + \sqrt{2}}{4}}$$

Oct 10-11:29 AM

$$\cos x = -\frac{4}{5} \quad 180^\circ < x < 270^\circ \quad 90^\circ < \frac{x}{2} < 135^\circ$$

Find $\cos 2x \hat{=} \cos \frac{x}{2}$

Q II

$$\cos < 0$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\cos 2x = 2\cos^2 x - 1$$

$$\cos 2x = 2\left(-\frac{4}{5}\right)^2 - 1$$

$$\cos 2x = 1 - 2\sin^2 x$$

$$= 2 \cdot \frac{16}{25} - 1$$

$$= \frac{32}{25} - \frac{25}{25}$$

$$= \frac{7}{25}$$

$$\cos \frac{x}{2} = \pm \sqrt{\frac{1 + \cos x}{2}}$$

$$= -\sqrt{\frac{1 - \frac{4}{5}}{2}} = -\sqrt{\frac{1}{10}}$$

$$= \boxed{-\frac{\sqrt{10}}{10}}$$

Oct 10-11:34 AM

$$\tan \frac{\pi}{12} = 2 - \sqrt{3} \quad \triangleleft$$

$$\tan \frac{\frac{\pi}{6}}{2} = \tan \frac{30^\circ}{2} = \frac{1 - \cos 30^\circ}{\sin 30^\circ} = \frac{1 - \frac{\sqrt{3}}{2}}{\frac{1}{2}}$$

$$= \frac{\text{LCD} \sqrt{3}}{1} = \boxed{2 - \sqrt{3}}$$

$$\tan \frac{A}{2} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

Oct 10-11:40 AM