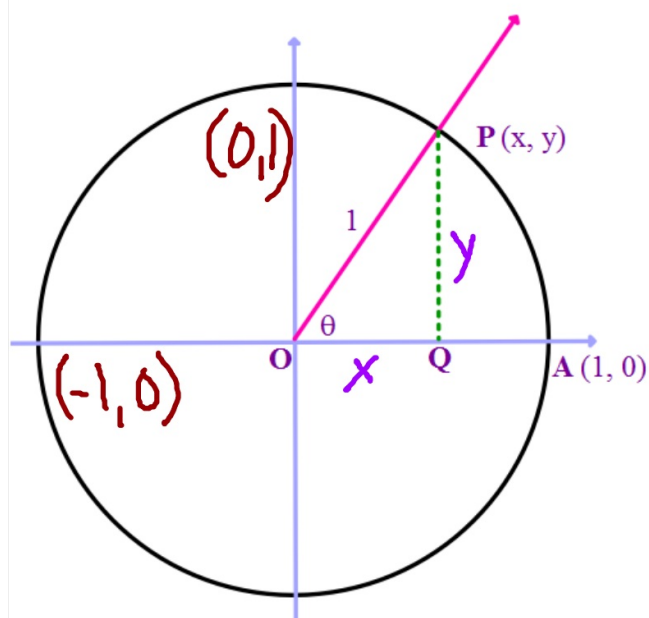


September 18

SWBAT:

Use trig identities to
evaluate related trig
functions



$$\sin \theta = y$$
$$\cos \theta = x$$

$$\tan \theta = \frac{y}{x} = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{x}{y} = \frac{\cos \theta}{\sin \theta}$$

$$\sec \theta = \frac{1}{x}$$

$$\csc \theta = \frac{1}{y}$$

Cofunction Identities

$$\sin(\theta) = \cos(90^\circ - \theta)$$

$$\cos(\theta) = \sin(90^\circ - \theta)$$

$$\cot(\theta) = \tan(90^\circ - \theta)$$

$$\sec(\theta) = \csc(90^\circ - \theta)$$

$$\tan(\theta) = \cot(90^\circ - \theta)$$

$$\csc(\theta) = \sec(90^\circ - \theta)$$

cos sec

sin csc

tan cot

★ Reciprocal Identities ★

$$\sin(\theta) = \frac{1}{\csc(\theta)} \quad \csc(\theta) = \frac{1}{\sin(\theta)}$$

$$\cos(\theta) = \frac{1}{\sec(\theta)} \quad \sec(\theta) = \frac{1}{\cos(\theta)}$$

$$\tan(\theta) = \frac{1}{\cot(\theta)} \quad \cot(\theta) = \frac{1}{\tan(\theta)}$$



Quotient Identities



$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} = \frac{\sec \theta}{\csc \theta}$$

$$\cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)} = \frac{\csc \theta}{\sec \theta}$$

Pythagorean Identities

$$\sin^2(\theta) + \cos^2(\theta) = 1$$



$$\frac{\sin^2(\theta)}{\sin^2 \theta} + \frac{\cos^2(\theta)}{\sin^2 \theta} = \frac{1}{\sin^2 \theta}$$

$$\frac{\sin \theta (\sin \theta)}{\sin \theta (\sin \theta)} + \frac{\cos \theta (\cos \theta)}{\sin \theta (\sin \theta)} = \frac{1}{\sin \theta (\sin \theta)}$$

$$1 + \cot \theta (\cot \theta) = \csc \theta (\csc \theta)$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$\frac{\sin^2(\theta)}{\cos^2 \theta} + \frac{\cos^2(\theta)}{\cos^2 \theta} = \frac{1}{\cos^2 \theta}$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$\sin(30^\circ) = 1/2$$

$$\tan(30^\circ) = 1/\sqrt{3}$$

Find $\csc(30^\circ)$

$\cos(30^\circ)$

$\cot(30^\circ)$

$\cot(60^\circ)$

$$\csc 30 = \frac{1}{\sin 30} = \frac{1}{1/2} = 1 \cdot 2 = 2$$

$$\tan 30 = \frac{\sin 30}{\cos 30}$$

$$\cos 30 \cdot \frac{1}{\sqrt{3}} = \frac{1}{2} \cdot \cos 30$$

$$\sqrt{3} \cdot \frac{\cos 30}{\sqrt{3}} = \frac{1}{2} \cdot \sqrt{3}$$

$$\cos 30 = \frac{\sqrt{3}}{2}$$

$$\cot(60) = \cot(90-30)$$

$$\cot(90-30) = \tan(30) = \frac{1}{\sqrt{3}}$$

$$\cot 30 = \frac{\cos 30}{\sin 30}$$

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

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

$$= \sqrt{3}$$

$$\sin(30^\circ) = 1/2$$

$$\tan(30^\circ) = 1/\sqrt{3}$$

Find $\csc(30^\circ)$

$\cos(30^\circ)$

$\cot(30^\circ)$

$\cot(60^\circ)$

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

$\cos(30^\circ)$

$$\sin^2(30) + \cos^2(30) = 1$$

$$\left(\frac{1}{2}\right)^2 + \cos^2(30) = 1$$

$$.25 + \cos^2(30) = 1$$

$$-.25 \quad \quad \quad -.25$$

$$\cos^2(30) = .75$$

$$\cos(30) = \sqrt{.75}$$

$$\cot(30^\circ) = \frac{\cos(30)}{\sin(30)} = \frac{\sqrt{.75}}{\frac{1}{2}}$$

$$\sqrt{.75} \cdot \frac{2}{1} = 2\sqrt{.75}$$

$$\cot(60) = \cot(90-30) = \tan(30)$$

$$= \frac{\sin(30)}{\cos(30)} = \frac{1/2}{\sqrt{.75}} = \frac{1}{2\sqrt{.75}}$$

$$\tan(\beta) = 5$$

Find $\cot(\beta)$

$\cos(\beta)$

• $\csc(\beta)$

$\tan(90^\circ - \beta)$

$$\cot \beta = \frac{1}{\tan \beta} = \frac{1}{5}$$

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

$$\sin \beta = \frac{1}{\frac{\sqrt{26}}{5}}$$

$$\sin \beta = \frac{5}{\sqrt{26}}$$

$$\tan \beta = \frac{\sin \beta}{\cos \beta}$$

$$5 = \frac{5}{\cos \beta}$$

$$5 \cos \beta = \frac{5}{\sqrt{26}}$$

$$\tan(90 - \beta) = \cot(\beta)$$

$$\tan(90 - \beta) = \frac{1}{5}$$

$$1 + \cot^2 \beta = \csc^2 \beta$$

$$1 + \left(\frac{1}{5}\right)^2 = \csc^2 \beta$$

$$1 + \frac{1}{25} = \csc^2 \beta$$

$$\frac{25}{25} + \frac{1}{25} = \csc^2 \beta$$

$$\frac{26}{25} = \csc^2 \beta$$

$$\sqrt{\frac{26}{25}} = \csc \beta = \frac{\sqrt{26}}{5}$$

$$\tan(\beta) = 5$$

Find $\cot(\beta)$

$\cos(\beta)$

$\csc(\beta)$

$\tan(90^\circ - \beta)$

$$\cot \beta = \frac{1}{\tan \beta} = \frac{1}{5}$$

$$\tan^2 \beta + 1 = \sec^2 \beta$$

$$5^2 + 1 = \sec^2 \beta$$

$$25 + 1 = \sec^2 \beta$$

$$26 = \sec^2 \beta$$

$$\sqrt{26} = \sec \beta$$

$$\cos \beta = \frac{1}{\sec \beta} = \frac{1}{\sqrt{26}}$$

$$\tan \beta = \frac{\sec \beta}{\csc \beta}$$

$$5 = \frac{\sqrt{26}}{\csc \beta}$$

$$\frac{5}{\sqrt{26}} = \frac{1}{\csc \beta}$$

$$\frac{\sqrt{26}}{5} = \csc \beta$$

$$\tan(90 - \beta) = \cot(\beta) = \frac{1}{5}$$

$$\tan \beta = \frac{\sin \beta}{\cos \beta}$$

$$\cos(\alpha) = 1/4$$

Find $\sin(\alpha)$

$\cot(\alpha)$

$\sec(\alpha)$

$\tan(90^\circ - \alpha)$

$$\sin(\alpha) =$$

$$\sin^2(\alpha) + \cos^2(\alpha) = 1$$

$$\sin^2(\alpha) + \left(\frac{1}{4}\right)^2 = 1$$

$$\sin^2(\alpha) + \frac{1}{16} = 1 \rightarrow \frac{15}{16}$$

$$\sin^2 \alpha = \frac{15}{16}$$

$$\sin(\alpha) = \frac{\sqrt{15}}{4}$$

$$1 + \cot^2 \alpha = \frac{1}{\sin^2 \alpha} = \frac{16}{15}$$

$$\sqrt{1 + \cot^2 \alpha} = \frac{1}{\sin \alpha} = \frac{4}{\sqrt{15}} \left(\frac{16}{15} - \frac{16}{16} \right)$$

$$\cot \alpha = \sqrt{1/15}$$

$$\cos(\alpha) = 1/4$$

$$\tan(90^\circ - \alpha)$$

$$\cot(\theta) = \tan(90^\circ - \alpha)$$

$$\frac{1}{\sqrt{15}} = \tan(90^\circ - \alpha)$$

$$\cos(\alpha) = 1/4$$

Find $\sin(\alpha)$

$\cot(\alpha)$

$\sec(\alpha)$

$\tan(90^\circ - \alpha)$

$$\left(\frac{1}{4}\right)^2 + \sin^2(\alpha) = 1$$

$$-.0625 + \sin^2(\alpha) = 1$$

$$\sqrt{\sin^2(\alpha)} = \sqrt{.9375}$$

$$\sin \alpha = \sqrt{.9375} = .968$$

$$\cos(\alpha) = \frac{1}{4}$$

$$\sec(\alpha) = \frac{1}{\cos(\alpha)} = 4$$

$$\cot(\alpha) = \frac{\cos(\alpha)}{\sin(\alpha)}$$

$$\cot(\alpha) = \frac{1/4}{\sqrt{.9375}} = .242$$

$$\frac{1/4}{\sqrt{.9375}}$$

$$= \tan(90^\circ - \alpha)$$

Cofunction

$$\cot(\alpha) = \tan(90^\circ - \alpha)$$