

SOLUTION

Section 1.3 – Evaluating Trigonometry Functions

Exercise

Simplify by using the table. $5 \sin^2 30^\circ$

Solution

$$5 \sin^2 30^\circ = 5 \left(\frac{1}{2} \right)^2 = \frac{5}{4}$$

Exercise

Simplify by using the table. $\sin^2 60^\circ + \cos^2 60^\circ$

Solution

$$\begin{aligned} \sin^2 60^\circ + \cos^2 60^\circ &= \left(\frac{\sqrt{3}}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \\ &= \frac{3}{4} + \frac{1}{4} \\ &= \underline{1} \end{aligned}$$

Exercise

Simplify by using the table. $(\tan 45^\circ + \tan 60^\circ)^2$

Solution

$$\begin{aligned} (\tan 45^\circ + \tan 60^\circ)^2 &= (1 + \sqrt{3})^2 \\ &= 1 + 3 + 2\sqrt{3} \\ &= \underline{4 + 2\sqrt{3}} \end{aligned}$$

Exercise

Find the exact value of $\csc 300^\circ$

Solution

$$\begin{aligned} \hat{\theta} &= 360^\circ - 300^\circ = 60^\circ \rightarrow 300^\circ \in QIV \\ \csc 300^\circ &= -\frac{1}{\sin 60^\circ} = -\frac{1}{\frac{\sqrt{3}}{2}} = \underline{-\frac{2}{\sqrt{3}}} \end{aligned}$$

Exercise

Find θ if $\sin \theta = -\frac{1}{2}$ and θ terminates in QIII with $0^\circ \leq \theta \leq 360^\circ$.

Solution

$$\hat{\theta} = \sin^{-1} \frac{1}{2}$$

$$= 30^\circ$$

$$\theta \in \text{QIII}$$

$$\Rightarrow \theta = 180^\circ + 30^\circ$$

$$= 210^\circ$$

Exercise

Find θ to the nearest degree if $\sec \theta = 3.8637$ and θ terminates in QIV with $0^\circ \leq \theta \leq 360^\circ$.

Solution

$$\sec \theta = 3.8637 = \frac{1}{\cos \theta}$$

$$\cos \theta = \frac{1}{3.8637}$$

$$\hat{\theta} = \cos^{-1} \frac{1}{3.8637}$$

$$= 75^\circ$$

$$\text{Calculator: } \cos^{-1}(1/3.8637)$$

$$\theta \in \text{QIV}$$

$$\Rightarrow \theta = 360^\circ - 75^\circ$$

$$= 285^\circ$$

Exercise

Find the exact value of $\cos 225^\circ$

Solution

$$\hat{\theta} = 225^\circ - 180^\circ = 45^\circ$$

$$\rightarrow 225^\circ \in \text{QIII}$$

$$\cos 225^\circ = -\cos 45^\circ$$

$$= -\frac{\sqrt{2}}{2}$$

Exercise

Find the exact value of $\tan 315^\circ$

Solution

$$\begin{aligned}\hat{\theta} &= 360^\circ - 315^\circ = 45^\circ && \rightarrow 315^\circ \in QIV \\ \tan 315^\circ &= -\tan 45^\circ = -1\end{aligned}$$

Exercise

Find the exact value of $\cos 420^\circ$

Solution

$$\begin{aligned}\hat{\theta} &= 420^\circ - 360^\circ = 60^\circ && \rightarrow 420^\circ \in QI \\ \cos 420^\circ &= \cos 60^\circ = \underline{\frac{1}{2}}\end{aligned}$$

Exercise

Find the exact value of $\cot 480^\circ$

Solution

$$\begin{aligned}\hat{\theta} &= 480^\circ - 360^\circ = 120^\circ \\ \hat{\theta} &= 180^\circ - 120^\circ = 60^\circ && \rightarrow 480^\circ \in QII \\ \cot 480^\circ &= -\frac{\cos 60^\circ}{\sin 60^\circ} \\ &= -\frac{1/2}{\sqrt{3}/2} \\ &= \underline{-\frac{1}{\sqrt{3}}}\end{aligned}$$

Exercise

Use the calculator to find the value of $\csc 166.7^\circ$

Solution

$$\begin{aligned}\csc 166.7^\circ &= \frac{1}{\sin 166.7^\circ} \\ &= \underline{\approx 4.3469}\end{aligned}$$

Exercise

Use the calculator to find the value of $\sec 590.9^\circ$

Solution

$$\begin{aligned}\sec 590.9^\circ &= \frac{1}{\cos 590.9^\circ} \\ &\approx -1.5856\end{aligned}$$

Exercise

Use the calculator to find the value of $\tan 195^\circ 10'$

Solution

$$\begin{aligned}\tan(195^\circ 10') &= \tan\left(195^\circ + \frac{10}{60}\right) \\ &= \tan 195.1667^\circ \\ &\approx .271\end{aligned}$$

Exercise

Use the calculator to find θ to the nearest degree if $\sin \theta = -0.3090$ with $\theta \in \text{QIV}$ with $0^\circ \leq \theta \leq 360^\circ$

Solution

$$\begin{aligned}\hat{\theta} &= \sin^{-1}(0.3090) \approx 18.0^\circ \\ \text{Since } \theta &\in \text{QIV} \\ \theta &= 180^\circ + 40.0^\circ \\ &= 220.0^\circ\end{aligned}$$

Exercise

Use the calculator to find θ to the nearest degree if $\cos \theta = -0.7660$ with $\theta \in \text{QIII}$ with $0^\circ \leq \theta \leq 360^\circ$

Solution

$$\begin{aligned}\hat{\theta} &= \cos^{-1}(0.7660) \approx 40.0^\circ && \text{Since } \theta \in \text{QIII} \\ \theta &= 180^\circ + 40.0^\circ \\ &= 220.0^\circ\end{aligned}$$

Exercise

Use the calculator to find θ to the nearest degree if $\sec \theta = -3.4159$ with $\theta \in \text{QII}$ with $0^\circ \leq \theta \leq 360^\circ$

Solution

$$\sec \theta = -3.4159$$

$$\cos \theta = -\frac{1}{3.4159}$$

$$\hat{\theta} = \cos^{-1}\left(\frac{1}{3.4159}\right) \approx 73.0^\circ \quad \text{Since } \theta \in \text{QII}$$

$$\theta = 180^\circ - 73.0^\circ$$

$$= \underline{107.0^\circ}$$

Exercise

Find θ to the nearest tenth of a degree if $\tan \theta = -0.8541$ and θ terminates in QIV with $0^\circ \leq \theta \leq 360^\circ$.

Solution

$$\hat{\theta} = \tan^{-1} 0.8541 \approx 40.5^\circ$$

$$\theta \in \text{QIV}$$

$$\Rightarrow \theta = 360^\circ - 40.5^\circ$$

$$= \underline{319.5^\circ}$$