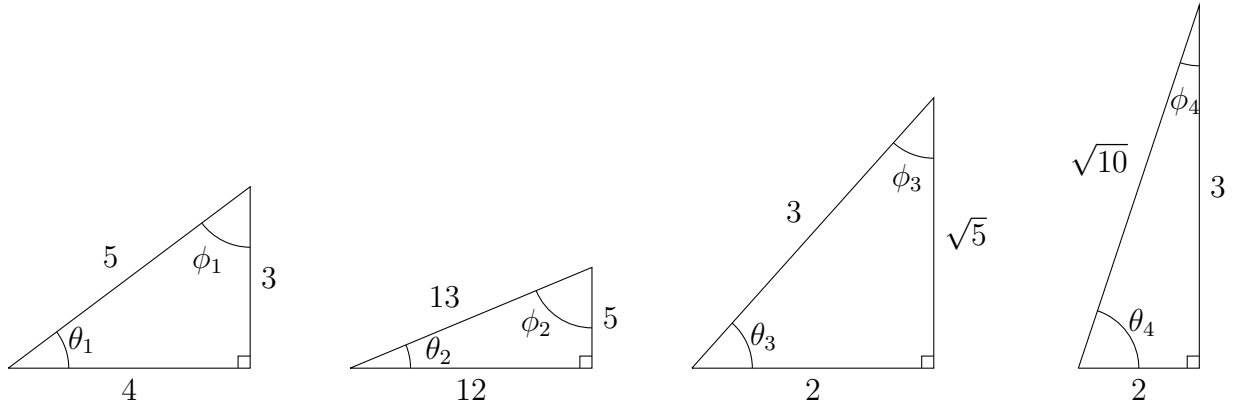


Trigonometry practice



1. For the angles $\theta_1, \theta_2, \theta_3, \theta_4, \phi_1, \phi_2, \phi_3,$ and ϕ_4 above, compute their sine, cosine, and tangent.

Answer:

	θ_1	θ_2	θ_3	θ_4	ϕ_1	ϕ_2	ϕ_3	ϕ_4
sin	$\frac{3}{5}$	$\frac{5}{13}$	$\frac{\sqrt{5}}{3}$	$\frac{3}{\sqrt{10}}$	$\frac{4}{5}$	$\frac{12}{13}$	$\frac{2}{3}$	$\frac{2}{\sqrt{10}}$
cos	$\frac{4}{5}$	$\frac{12}{13}$	$\frac{2}{3}$	$\frac{2}{\sqrt{10}}$	$\frac{3}{5}$	$\frac{5}{13}$	$\frac{\sqrt{5}}{3}$	$\frac{3}{\sqrt{10}}$
tan	$\frac{3}{4}$	$\frac{5}{12}$	$\frac{\sqrt{5}}{2}$	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{12}{5}$	$\frac{2}{\sqrt{5}}$	$\frac{2}{3}$

2. What relationships (if any) do you see between the two (non-right) angles of a right-triangle in terms of their evaluation of trigonometric functions?

Answer:

There are a number of patterns, here are three of them.

$$\tan(\theta_i) = \frac{1}{\tan(\phi_i)} \quad \text{for } i \text{ in } \{1, 2, 3, 4\},$$

$$\sin(\theta_i) = \cos(\phi_i) \quad \text{for } i \text{ in } \{1, 2, 3, 4\},$$

and

$$\cos(\theta_i) = \sin(\phi_i) \quad \text{for } i \text{ in } \{1, 2, 3, 4\}.$$

3. Simplify the following expressions

$$\arctan\left(\cos\left(\frac{\pi}{2}\right)\right), \quad \arccos\left(\sin\left(\frac{2\pi}{3}\right)\right), \quad \arcsin\left(\tan\left(\frac{\pi}{4}\right)\right)$$

$$\arccos\left(\sin\left(\frac{\pi}{3}\right)\right), \quad \arctan\left(\sin\left(\frac{3\pi}{2}\right)\right), \quad \arcsin\left(\cos\left(\frac{5\pi}{6}\right)\right)$$

Answer:

$$\arctan\left(\cos\left(\frac{\pi}{2}\right)\right) = \arctan(0) = 0, \quad \arccos\left(\sin\left(\frac{2\pi}{3}\right)\right) = \arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$$

$$\arcsin\left(\tan\left(\frac{\pi}{4}\right)\right) = \arcsin(1) = \frac{\pi}{2}, \quad \arccos\left(\sin\left(\frac{\pi}{3}\right)\right) = \arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$$

$$\arctan\left(\sin\left(\frac{3\pi}{2}\right)\right) = \arctan(-1) = \frac{-\pi}{4}$$

$$\arcsin\left(\cos\left(\frac{5\pi}{6}\right)\right) = \arccos\left(\frac{-\sqrt{3}}{2}\right) = \frac{-\pi}{3}$$

4. Simplify the following expressions

$$\tan\left(\arccos\left(\frac{1}{\sqrt{2}}\right)\right), \quad \cos\left(\arcsin\left(\frac{\sqrt{3}}{2}\right)\right), \quad \sin\left(\arctan\left(\sqrt{3}\right)\right)$$

$$\cos\left(\arctan\left(\frac{-1}{\sqrt{3}}\right)\right), \quad \sin\left(\arccos\left(\frac{1}{3}\right)\right), \quad \cos\left(\arctan\left(\frac{3}{4}\right)\right)$$

Answer:

$$\tan\left(\arccos\left(\frac{1}{\sqrt{2}}\right)\right) = 1, \quad \cos\left(\arcsin\left(\frac{\sqrt{3}}{2}\right)\right) = \frac{1}{2}, \quad \sin\left(\arctan\left(\sqrt{3}\right)\right) = \frac{\sqrt{3}}{2}$$

$$\cos\left(\arctan\left(\frac{-1}{\sqrt{3}}\right)\right) = \frac{\sqrt{3}}{2}, \quad \sin\left(\arccos\left(\frac{1}{3}\right)\right) = \frac{\sqrt{8}}{3}, \quad \cos\left(\arctan\left(\frac{3}{4}\right)\right) = \frac{4}{5}$$