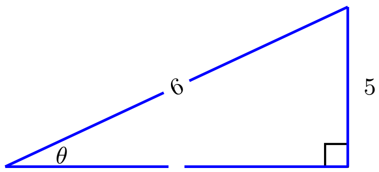
For each angle, draw and label a reference triangle, then determine all 6 trig ratios, sine , cosine, tangent, secant, cosecant, and cotangent. Do not use calculators here.

1. Find the angle θ



Solution: In this case, we know the opposite and the hypothenuse sides. The function describing such ratio is the sine, thus

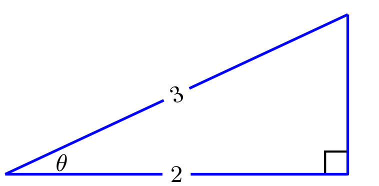
$$\sin\theta = \frac{5}{6}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \sin^{-1}\left(\frac{5}{6}\right)\\ &\approx 0.985 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 56.443^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\sin\theta = \frac{5}{6}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arcsin function.

2. Find the angle θ



Solution: In this case, we know the adjacent and the hypothenuse sides. The function describing such ratio is the cosine, thus

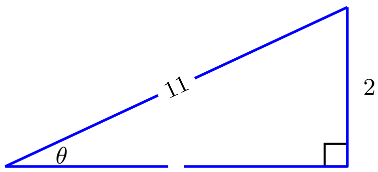
$$\cos\theta = \frac{2}{3}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \cos^{-1}\left(\frac{2}{3}\right)\\ &\approx 0.841 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 48.19^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\cos\theta = \frac{2}{3}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arccos function.

3. Find the angle θ



Solution: In this case, we know the opposite and the hypothenuse sides. The function describing such ratio is the sine, thus

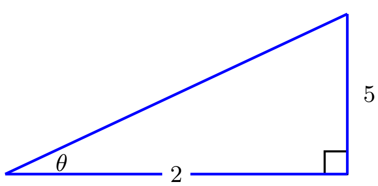
$$\sin\theta = \frac{2}{11}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \sin^{-1}\left(\frac{2}{11}\right)\\ &\approx 0.183 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 10.476^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\sin\theta = \frac{2}{11}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arcsin function.

4. Find the angle θ



Solution: In this case, we know the opposite and the adjacent sides. The function describing such ratio is the tangent, thus

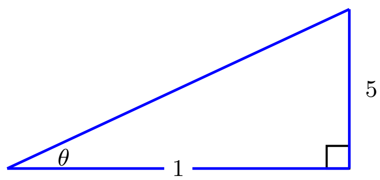
$$\tan\theta = \frac{5}{2}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \tan^{-1}\left(\frac{5}{2}\right)\\ &\approx 1.19 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 68.199^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\tan\theta = \frac{5}{2}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arctan function.

5. Find the angle θ



Solution: In this case, we know the opposite and the adjacent sides. The function describing such ratio is the tangent, thus

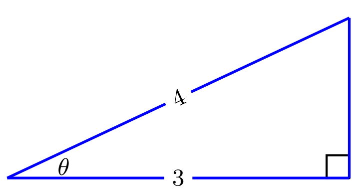
$$\tan\theta = \frac{5}{1}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \tan^{-1}\left(\frac{5}{1}\right)\\ &\approx 1.373 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 78.69^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\tan\theta = \frac{5}{1}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arctan function.

6. Find the angle θ



Solution: In this case, we know the adjacent and the hypothenuse sides. The function describing such ratio is the cosine, thus

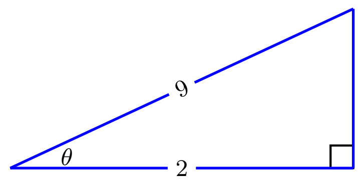
$$\cos\theta = \frac{3}{4}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \cos^{-1}\left(\frac{3}{4}\right)\\ &\approx 0.723 \qquad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 41.41^\circ \qquad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\cos\theta = \frac{3}{4}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arccos function.

7. Find the angle θ



Solution: In this case, we know the adjacent and the hypothenuse sides. The function describing such ratio is the cosine, thus

$$\cos\theta = \frac{2}{9}$$

Since this is not a famous ratio, we allow ourselves use of a calculator to estimate the sought angle.

$$\begin{aligned}\theta &= \cos^{-1}\left(\frac{2}{9}\right)\\ &\approx 1.347 \quad \text{(in radians [see calculator mode]... OR...)}\\ &\approx 77.16^\circ \quad \text{(in degrees [see calculator mode])}\end{aligned}$$

... it should be noted that we will revisit the equation $\cos\theta = \frac{2}{9}$ under a different context, where we will solve it completely, not limited to the domain and codomain of the arccos function.

8.

$$\cos^{-1}(\cos(30^\circ)) = 30^\circ$$

A. TRUE B. FALSE

9.

$$\cos^{-1}(\cos(-30^\circ)) = -30^\circ$$

A. TRUE B. FALSE

10.

$$\tan^{-1}(\tan(30^\circ)) = 30^\circ$$

A. TRUE B. FALSE

11.

$$\tan^{-1}(\tan(210^\circ)) = 210^\circ$$

A. TRUE B. FALSE

12.

$$\tan\left[\tan^{-1}\left(\frac{1}{3}\right)\right] = \frac{1}{3}$$

A. TRUE B. FALSE

13.

$$\tan\left[\tan^{-1}\left(\frac{5}{3}\right)\right] = \frac{5}{3}$$

A. TRUE B. FALSE

14.

$$\cos\left[\cos^{-1}\left(\frac{5}{13}\right)\right] = \frac{5}{13}$$

A. TRUE B. FALSE

15. Compute

$$\sin\left(\cos^{-1}(.3456)\right)$$

Solution: First, the stuff inside, $\cos^{-1}(.3456) \approx 69.78°$ then...
$\sin(69.78°) \approx 0.9384$

16. Compute

$$\tan\left(\cos^{-1}(.1234)\right)$$

Solution: First, the stuff inside, $\cos^{-1}(.1234) \approx 82.91°$ then...
$\tan(82.91°) \approx 8.0418$
note: the self quiz on "mission accomplished" prob #2 outlines a different approach to this same question.