

Precalculus · Inverse Trigonometric Functions and Trigonometric Equations · Worksheet

Common Core F-TF.B.6, F-TF.B.7 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This precalculus inverse trig worksheet gives 24 problems on inverse trigonometric functions and trigonometric equations, ordered from easy to hard, with a separate answer key.

These problems practice evaluating arcsin, arccos, and arctan, understanding restricted domains, and solving trigonometric equations on an interval and in general (F-TF.B.6 and F-TF.B.7).

Early problems use exact values; later ones use a calculator in radian or degree mode. The last six problems place trig equations in real situations such as ramps, ladders, daylight, and household voltage.

Precalculus Common Core: F-TF.B.6 · F-TF.B.7

Precalculus Inverse Trig Worksheet: problems 1-5

Problem 1: Evaluate arcsin

Find the exact value of each expression.

- a. $\sin^{-1}\left(\frac{1}{2}\right)$
- b. $\sin^{-1}\left(-\frac{1}{2}\right)$
- c. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$
- d. $\sin^{-1}(-1)$

Problem 2: Evaluate arccos

Find the exact value of each expression.

- a. $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right)$
- b. $\cos^{-1}\left(-\frac{1}{2}\right)$
- c. $\cos^{-1}(0)$
- d. $\cos^{-1}(-1)$

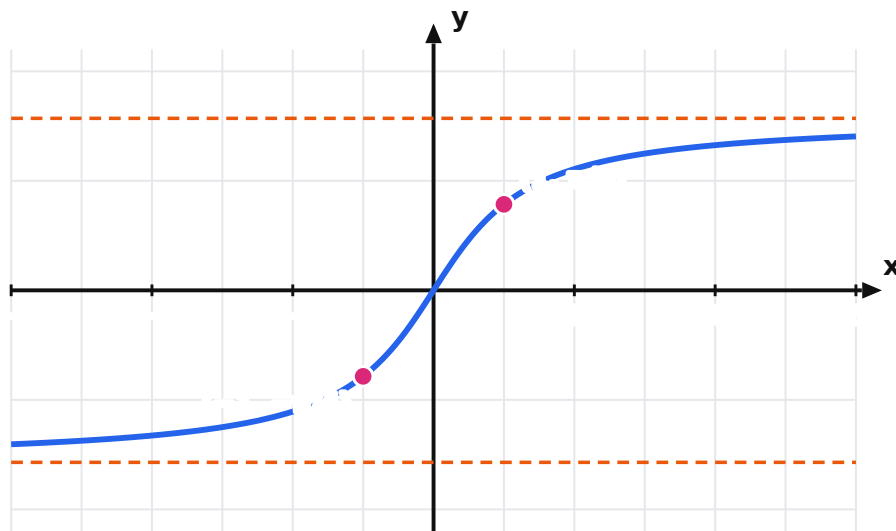
Problem 3: Evaluate arctan

Find the exact value of each expression.

- a. $\tan^{-1}(1)$
- b. $\tan^{-1}(-1)$
- c. $\tan^{-1}(\sqrt{3})$
- d. $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

Problem 4: Graph of arctan

The graph shows $y = \tan^{-1}x$. State its domain, its range, and the equations of its two horizontal asymptotes. Then find $\tan^{-1}(0)$.

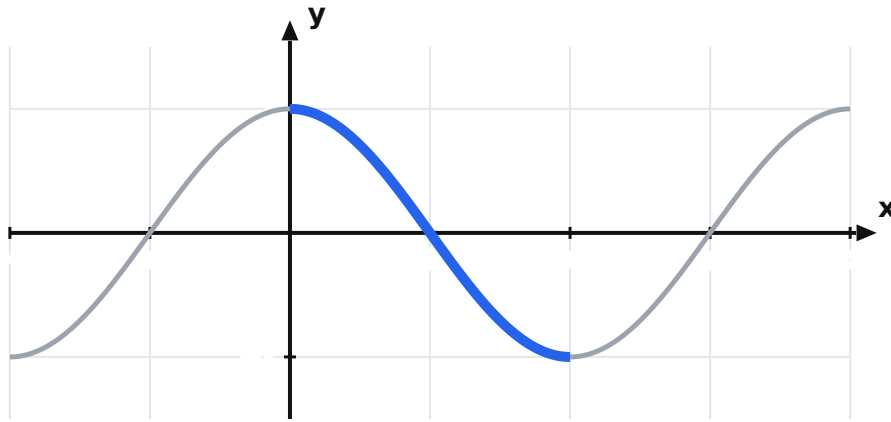


Graph of arctan with two dashed horizontal lines.

Problem 5: Restricted cosine

The graph of $y = \cos x$ is shown with the thick piece used to define $\cos^{-1}x$. State the interval of the thick piece, then find each value.

- a. $\cos^{-1}\left(\cos\frac{\pi}{3}\right)$
- b. $\cos^{-1}\left(\cos\left(-\frac{\pi}{3}\right)\right)$
- c. $\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$



Cosine with the piece on 0 to pi drawn thick.

Precalculus Inverse Trig Worksheet: problems 6-10

Problem 6: Compositions that cancel

Simplify each expression, or write undefined.

- $\sin(\sin^{-1}(0.3))$
- $\cos(\cos^{-1}(-0.8))$
- $\tan(\tan^{-1}(25))$
- $\sin(\sin^{-1}(1.2))$

Problem 7: Arcsine of a sine

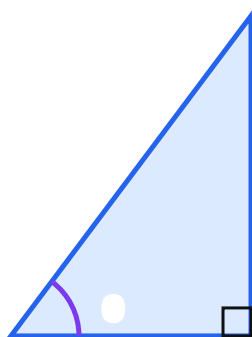
Find each value.

- $\sin^{-1}\left(\sin\frac{\pi}{4}\right)$
- $\sin^{-1}\left(\sin\frac{3\pi}{4}\right)$
- $\sin^{-1}\left(\sin\frac{7\pi}{6}\right)$
- $\sin^{-1}\left(\sin\left(-\frac{2\pi}{3}\right)\right)$

Problem 8: Triangle compositions

The triangle shows an angle θ with $\cos\theta = \frac{3}{5}$. Find the exact value of each expression.

- $\sin(\cos^{-1}\frac{3}{5})$
- $\cos(\sin^{-1}\frac{5}{13})$
- $\tan(\cos^{-1}\frac{4}{5})$
- $\tan(\sin^{-1}(-\frac{3}{5}))$



Right triangle with adjacent side 3 and hypotenuse 5.

Problem 9: Calculator practice

With the calculator in radian mode, evaluate each expression to the nearest hundredth.

- a. $\sin^{-1}(0.35)$
- b. $\cos^{-1}(0.2)$
- c. $\tan^{-1}(4)$
- d. $\cos^{-1}(-0.65)$

Problem 10: Solve a sine equation

Solve $\sin x = \frac{\sqrt{3}}{2}$ for $0 \leq x < 2\pi$.

Precalculus Inverse Trig Worksheet: problems 11-15

Problem 11: Solve a cosine equation

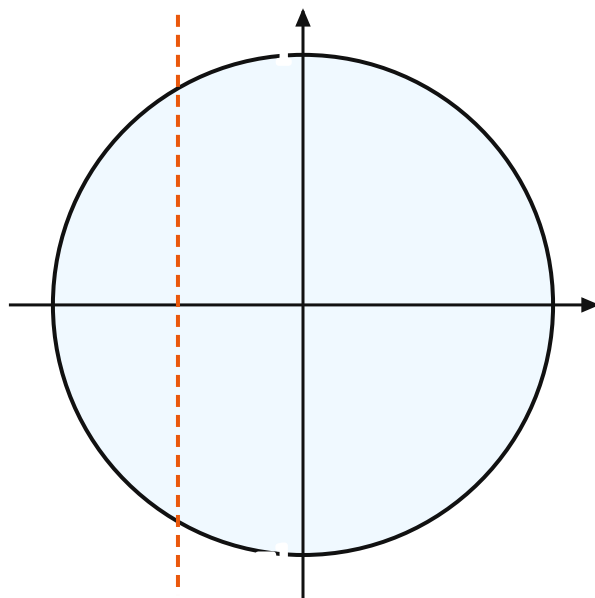
Solve $\cos x = -\frac{\sqrt{2}}{2}$ for $0 \leq x < 2\pi$.

Problem 12: Solve a tangent equation

Solve $\tan x = -1$ for $0 \leq x < 2\pi$.

Problem 13: Equation with a unit circle

Solve $2\cos x + 1 = 0$ for $0 \leq x < 2\pi$. The vertical line on the unit circle shows where $\cos x$ has the needed value.



Unit circle with a vertical dashed line.

Problem 14: Sine equation by calculator

Solve $3\sin x = 1.2$ for $0 \leq x < 2\pi$. Round to the nearest hundredth.

Problem 15: Cosine equation by calculator

Solve $\cos x = 0.3$ for $0 \leq x < 2\pi$. Round to the nearest hundredth.

Precalculus Inverse Trig Worksheet: problems 16-20

Problem 16: General solutions

Write all real solutions. Let k be any integer.

- a. $\sin x = \frac{1}{2}$
- b. $\cos x = 0$
- c. $\tan x = \sqrt{3}$

Problem 17: Quadratic in sine

Solve $2\sin^2 x - \sin x - 1 = 0$ for $0 \leq x < 2\pi$.

Problem 18: Multiple-angle equation

Solve $\sin 2x = \frac{\sqrt{2}}{2}$ for $0 \leq x < 2\pi$.

Problem 19: Wheelchair ramp

A wheelchair ramp is 12 ft long and rises 1 ft. Find the angle θ the ramp makes with the ground, in degrees to the nearest hundredth.



Ramp as a thin right triangle.

Problem 20: Ladder angle

The base of a 16-ft ladder is 4 ft from a wall.

- Find the angle the ladder makes with the ground, to the nearest tenth of a degree.
- How far from the wall should the base be to make a 70° angle? Round to the nearest tenth of a foot.

Precalculus Inverse Trig Worksheet: problems 21-24

Problem 21: Daylight hours

The hours of daylight in a northern city are $D(t) = 12 + 4\sin\left(\frac{2\pi}{365}(t-80)\right)$, where t is the day of the year. Find the days when $D = 14$ and describe when the city has more than 14 hours of daylight.

Problem 22: Spring height

A weight on a spring has height $h(t) = 20 + 6\cos\left(\frac{2\pi t}{3}\right)$ inches above the floor, with t in seconds. Find all times in $0 \leq t < 3$ when the weight is 23 in high, and when it is 16 in high (nearest hundredth).

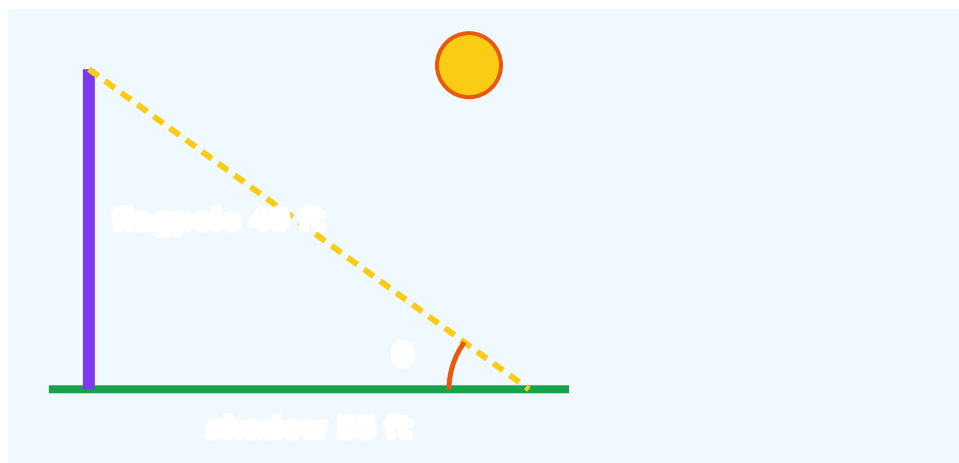
Problem 23: Household voltage

The voltage of a US wall outlet is $V(t) = 170\sin(120\pi t)$ volts, with t in seconds. Find the first two times in one cycle when $V = 100$ (in milliseconds, nearest hundredth). Then state the length of one cycle.

Problem 24: Sun angle

A 40-ft flagpole casts a 55-ft shadow.

- a. Find the angle of elevation of the sun to the nearest tenth of a degree.
- b. How long is the shadow when the sun is 60° above the horizon? Round to the nearest tenth of a foot.



Flagpole, shadow, and sun ray.

How to use this precalculus inverse trig worksheet

Print this precalculus inverse trig worksheet as a PDF, solve every problem on paper, then compare with the answer key.

