

Precalculus - Trigonometric Identities - Worksheet

Common Core F-TF.C.8, F-TF.C.9 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice trigonometric identities (Common Core F-TF.C.8 and F-TF.C.9). You will simplify expressions, use sum, difference and double-angle formulas for exact values, verify identities and solve equations.

Precalculus · Common Core State Standards: **F-TF.C.8, F-TF.C.9**

Exercise 1 - Simplify a product

Simplify $\tan x \cos x$.

Exercise 2 - Pythagorean simplification

Simplify $\frac{1 - \cos^2 x}{\sin x}$.

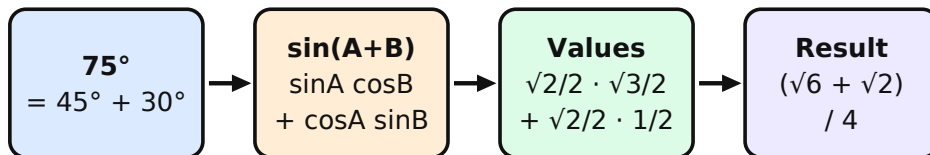
Exercise 3 - Sum of squares

Simplify $\sin^2 x + \cos^2 x + \tan^2 x$ in terms of cosine.

Exercise 4 - Double angle values

If $\sin \theta = \frac{3}{5}$ and θ is in quadrant II, find $\sin 2\theta$ and $\cos 2\theta$.

Exercise 5 - Exact sine of 15 degrees



Same method as $\sin 75$ degrees.

Find the exact value of $\sin 15^\circ$ by writing $15^\circ = 45^\circ - 30^\circ$.

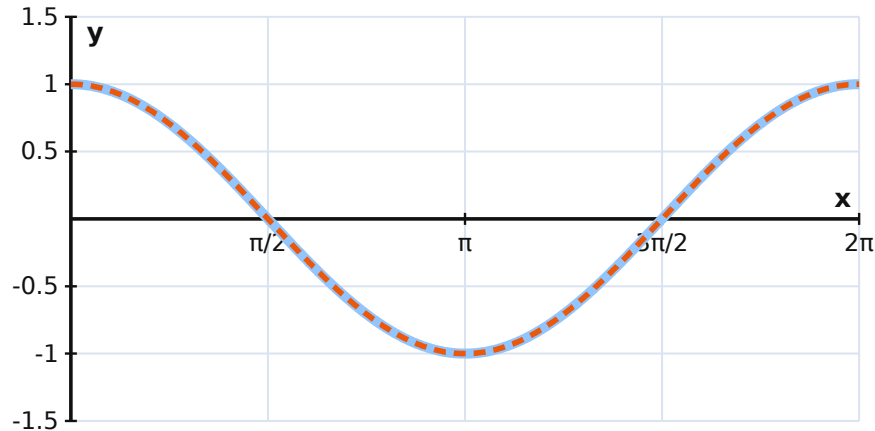
Exercise 6 - Exact cosine of 15 degrees

Find the exact value of $\cos 15^\circ$.

Exercise 7 - Tangent sum

Find $\tan\left(\frac{\pi}{4} + \frac{\pi}{6}\right)$ exactly using $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$.

Exercise 8 - Shift identity



Two curves that look the same.

Use the sum formula to show $\sin\left(x + \frac{\pi}{2}\right) = \cos x$.

Exercise 9 - Verify a square

Verify $(\sin x + \cos x)^2 = 1 + \sin 2x$.

Exercise 10 - Verify with fractions

Verify $\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = \frac{2}{\sin x}$.

Exercise 11 - Verify tangent plus cotangent

Verify $\tan x + \frac{\cos x}{\sin x} = \frac{1}{\sin x \cos x}$.

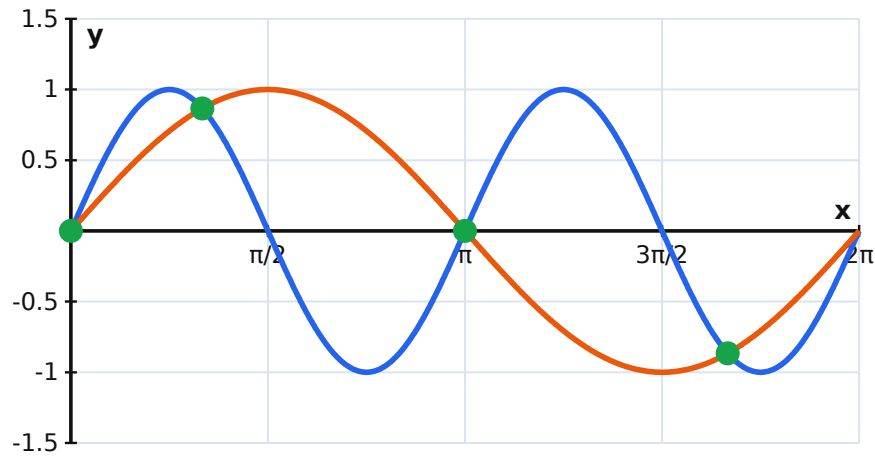
Exercise 12 - Half-angle power

Use $\cos 2x = \frac{1 + \cos 2x}{2}$ to find $\cos^2 \frac{\pi}{8}$ exactly.

Exercise 13 - Cosine double angle from sine

If $\sin x = \frac{1}{3}$, find $\cos 2x$.

Exercise 14 - Solve with a double angle



Graphs of $\sin 2x$ and $\sin x$.

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

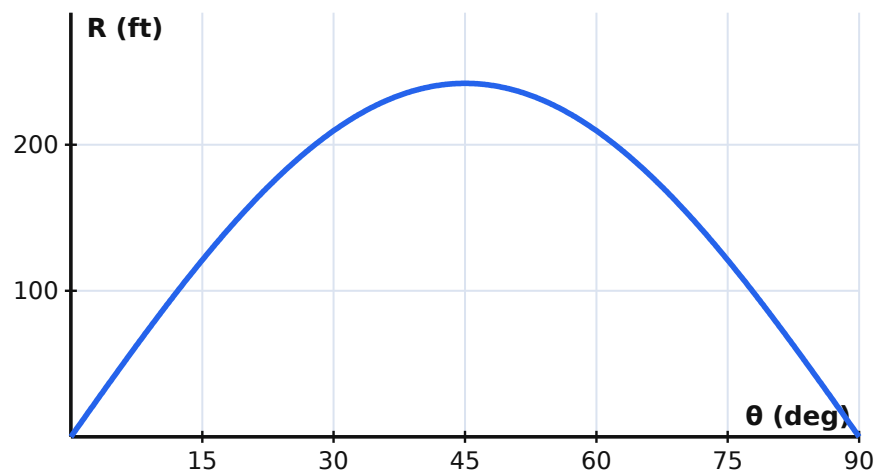
Exercise 15 - Solve $\cos 2x = \cos x$

Solve $\cos 2x = \cos x$ for $0 \leq x < 2\pi$.

Exercise 16 - Use Pythagorean to solve

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

Exercise 17 - Projectile range



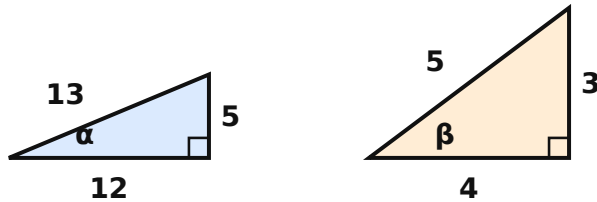
Range of a projectile as the launch angle changes.

A ball launched at $v = 88$ ft/s with angle θ travels $R = \frac{v^2 \sin 2\theta}{32}$ feet. Find R for $\theta = 30^\circ$ and $\theta = 45^\circ$, to the nearest foot.

Exercise 18 - Electrical amplitude

The voltage is $V = 170 \sin t \cos t$. Use a double-angle formula to write it as a single sine and give the amplitude.

Exercise 19 - Sum of two angles



Two acute angles.

Acute angles α and β satisfy $\sin \alpha = \frac{5}{13}$ and $\cos \beta = \frac{4}{5}$. Find $\sin(\alpha + \beta)$ and $\cos(\alpha + \beta)$.

Exercise 20 - Prove a triple angle

Show that $\cos 3x = 4\cos^3 x - 3\cos x$ by writing $\cos 3x = \cos(2x + x)$.