Trig Identities Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

Which of the following is a Pythagorean identity?

Hint: Recall the fundamental Pythagorean identities.

- ◯ **A) $\sin^2\theta + \cos^2\theta = 1$ ✓**
- ◯ B) $\tan^2\theta + \sec^2\theta = 1$
- ◯ C) $\sin \theta = 1/\cos \theta$
- ◯ D) $\tan \theta = \sin \theta/\cos \theta$

> The correct answer is A) $\sin^2\theta + \cos^2\theta = 1$, which is a fundamental Pythagorean identity.

Select all the reciprocal identities.

Hint: Identify the identities that express one function in terms of another.

- ☐ **A) $\sin \theta = 1/\csc \theta$ ✓**
- ☐ **B) $\cos \theta = 1/\sec \theta$ ✓**
- ☐ C) $\tan \theta = \sin \theta/\cos \theta$
- ☐ **D) $\csc \theta = 1/\sin \theta$ ✓**

> The correct answers are A, B, and D, which are all reciprocal identities.

Explain the significance of the identity $\tan \theta = \sin \theta/\cos \theta$ in trigonometry.

Hint: Consider how this identity relates to the definitions of sine, cosine, and tangent.

> **This identity shows the relationship between the sine and cosine functions and defines the tangent function in terms of these two.**

List the three Pythagorean identities.

Hint: Recall the fundamental relationships involving sine, cosine, and tangent.

1. 1) $\sin^2\theta + \cos^2\theta = 1$

> This is the fundamental Pythagorean identity.

2. 2) $1 + \tan^2\theta = \sec^2\theta$

> This relates tangent and secant.

3. 3) $1 + \cot^2\theta = \csc^2\theta$

> This relates cotangent and cosecant.

> The three Pythagorean identities are: 1) $\sin^2\theta + \cos^2\theta = 1$, 2) $1 + \tan^2\theta = \sec^2\theta$, 3) $1 + \cot^2\theta = \csc^2\theta$.

What is the reciprocal of tan θ?

Hint: Recall the definition of tangent in terms of sine and cosine.

- ◯ A) sin θ
- ◯ B) cos θ

- ◯ **C) cot θ ✓**
- ◯ D) sec θ

> The correct answer is C) cot θ, which is the reciprocal of tangent.

Part 2: Application and Analysis

Which identity can be used to express cos(2θ) in terms of sin θ only?

Hint: Consider the double angle identities for cosine.

- ◯ A) $\cos(2\theta) = \cos^2\theta - \sin^2\theta$
- ◯ B) $\cos(2\theta) = 2\cos^2\theta - 1$
- ◯ **C) $\cos(2\theta) = 1 - 2\sin^2\theta$ ✓**
- ◯ D) $\cos(2\theta) = \sin(2\theta)$

> The correct answer is C) $\cos(2\theta) = 1 - 2\sin^2\theta$, which expresses cosine in terms of sine.

Identify the angle sum identities.

Hint: Recall the formulas for sine, cosine, and tangent of the sum of two angles.

- ☐ **A) sin(a + b) = sin a cos b + cos a sin b ✓**
- ☐ **B) cos(a + b) = cos a cos b - sin a sin b ✓**
- ☐ **C) tan(a + b) = (tan a + tan b)/(1 - tan a tan b) ✓**
- ☐ **D) sin(a - b) = sin a cos b - cos a sin b ✓**

> The correct answers are A, B, C, and D, which are all angle sum identities.

Solve for θ if cos(2θ) = 1/2 and θ is in the first quadrant.

Hint: Use the inverse cosine function to find the angle.

> **To solve for θ, you can use the identity cos(2θ) = 1/2 and find the corresponding angle in the first quadrant.**

Which identity is used to transform sin a sin b into a sum?

Hint: Consider the product-to-sum identities.

- ◯ **A) Product-to-Sum Identity ✓**
- ◯ B) Sum-to-Product Identity
- ◯ C) Double Angle Identity
- ◯ D) Reciprocal Identity

> The correct answer is A) Product-to-Sum Identity, which transforms products of sine functions into sums.

Which of the following expressions can be simplified using the identity $\sin^2\theta + \cos^2\theta = 1$?

Hint: Look for expressions that involve sine and cosine squared.

- ☐ **A) $\sin^2\theta + \cos^2\theta$ ✓**
- ☐ **B) $\tan^2\theta + 1$ ✓**
- ☐ **C) $\sec^2\theta - \tan^2\theta$ ✓**
- ☐ D) $\cot^2\theta + 1$

> The correct answers are A, B, and C, which can all be simplified using the Pythagorean identity.

Part 3: Evaluation and Creation

Which identity is essential for proving that tan(a + b) = (tan a + tan b)/(1 - tan a tan b)?

Hint: Consider the angle sum identities for tangent.

- ◯ **A) Angle Sum Identity for Sine ✓**
- ◯ B) Angle Sum Identity for Cosine
- ◯ C) Double Angle Identity for Tangent
- ◯ D) Reciprocal Identity

> The correct answer is A) Angle Sum Identity for Sine, which is used in the proof of the tangent sum identity.

Evaluate the following statements and select those that are true regarding half-angle identities.

Hint: Consider the properties and applications of half-angle identities.

- ☐ **A) They can be derived from double angle identities. ✓**
- ☐ **B) They are useful for finding exact values of trigonometric functions at specific angles. ✓**
- ☐ C) They are primarily used in calculus for integration.
- ☐ D) They are equivalent to the reciprocal identities.

> The correct answers are A and B, which are true statements about half-angle identities.

Create a real-world problem that involves using the sum-to-product identities to simplify an expression. Provide a detailed solution.

Hint: Think of a scenario where trigonometric functions are involved.

> **Students should create a problem that applies sum-to-product identities and provide a clear solution.**

Propose a method to verify the identity sin(2θ) = 2sin θ cos θ using basic trigonometric identities.

Hint: Consider using the angle sum identity for sine.

1. Step 1: Use the angle sum identity for sine.

> sin(2θ) = sin(θ + θ) = sin θ cos θ + cos θ sin θ.

2. Step 2: Factor out the common terms.

> This gives 2sin θ cos θ.

> Students should outline a method that involves using the angle sum identity to verify the double angle identity for sine.