Civil Engineering Licensure Exam – Mock Exam (Day 3: Trigonometry)

February 23, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Trigonometric Identities, Equations, and Solutions of Triangles
- Total Questions: 10 (Multiple Choice & Problem-Solving)
- Show complete solutions for problem-solving questions.

Section A: Multiple Choice Questions (MCQs)

Choose the best answer.

1. Simplify $\sin^2 x + \cos^2 x$.
   (a) 0
   (b) 1
   (c) $\sin x \cos x$
   (d) 2
2. Solve for x in the equation $\cos x = \frac{1}{2}$ for $0^\circ \leq x \leq 360^\circ$.
   (a) $30^\circ, 150^\circ$
   (b) $60^\circ, 300^\circ$
   (c) $45^\circ, 225^\circ$

(d) $90°, 270°$

3. Which of the following is an identity?

   (a) $\tan x = \frac{\sin x}{\cos x}$
   (b) $\sin x = \frac{1}{\cos x}$
   (c) $\cos x = \frac{1}{\sin x}$
   (d) $\tan x = \sin x + \cos x$

4. Given a right triangle where θ is an acute angle and $\tan\theta = \frac{3}{4}$, what is $\sin\theta$?

   (a) $\frac{3}{5}$
   (b) $\frac{4}{5}$
   (c) $\frac{5}{3}$
   (d) $\frac{4}{3}$

5. Using the Law of Sines, solve for $\angle B$ in a triangle where $a = 8$, $b = 10$, and $\angle A = 40°$.

   (a) $49.1°$
   (b) $51.2°$
   (c) $55.3°$
   (d) $58.4°$

Section B: Problem-Solving

1. Prove the identity:
$$\frac{1-\cos 2x}{\sin 2x} = \tan x$$

2. Solve for x in:
$$2\sin x - 1 = 0, \quad 0^\circ \leq x \leq 360^\circ$$

3. Given $\cos A = 0.6$, find $\sin 2A$.

4. Solve the triangle using the Law of Cosines where:
$$a = 7, \quad b = 9, \quad c = 12.$$

5. A tower casts a shadow of 20 meters when the angle of elevation of the sun is 30°. Find the height of the tower.