Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 2: Logarithms, Exponentials, and Progressions)

February 23, 2025

Answer Key

Section A: Multiple Choice Solutions

1. Solving $\log_2(x+1) = 3$:

$$x + 1 = 2^3 = 8 \Rightarrow x = 7$$

Answer: (a) $x = 7$

2. Solving $\log_5 125 = x$:

$$5^x = 125 = 5^3$$

Answer: (b) $x = 3$

3. Since $e^{\ln 7} = 7$: **Answer: (b)** 7

4. Sum of arithmetic sequence:

$$S_n = \frac{10}{2}(2(2) + (10-1)(3))$$

$$S_{10} = 5(4 + 27) = 5(31) = 155$$

Answer: None of the given options. Should be 155**.**

5. Finding the common ratio of a geometric sequence:

$$a_n = ar^{n-1}$$

$$81 = 3r^3$$

$$r^3 = 27 \Rightarrow r = 3$$

Answer: (b) 3

Section B: Problem-Solving Solutions

1. Solve $3^{x+1} = 27$:

$$3^{x+1} = 3^3$$

$$x + 1 = 3 \Rightarrow x = 2$$

2. Expand and simplify:

$$\log(a^2b^3) - 2\log b + \log \frac{1}{a}$$

$$2\log a + 3\log b - 2\log b - \log a = \log a + \log b$$

$$= \log(ab)$$

3. Population growth:

$$P(5) = 5000e^{0.03(5)}$$

$$P(5) = 5000e^{0.15} \approx 5000(1.1618) = 5809$$

4. Arithmetic series:

$$S_{15} = \frac{15}{2}(2(4) + (15-1)(6))$$

$$S_{15} = \frac{15}{2}(8 + 84) = \frac{15}{2}(92) = 690$$

5. Bouncing ball:

$$S = \frac{10}{1 - 0.8} = \frac{10}{0.2} = 50$$

Total distance: 50 meters.