Algebra II | Activity 0420 | Name:
Dr. Paul L. Bailey | Wednesday, April 20, 2022

These problems are designed for use with a scientific calculator. All answers are real numbers, and whose approximate values must be written with three decimal places.

Problem 1. Compute $\log_7(100)$.

Problem 2. Solve $\log_x(7) = 100$.

Problem 3. Find all $x \in \mathbb{R}$ such that
$$3^{x^2-16} = 27^{x+4}.$$

Problem 4. Find all $x \in \mathbb{R}$ such that
$$\log_x(6x-5) = 2.$$

Problem 5. Find all $x \in \mathbb{R}$ such that
$$10^{2x} - 10^x = 12.$$

Problem 6. Find all $x \in \mathbb{R}$ such that
$$\log_9(x) + \log_{27}(x) = 15.$$

Problem 7. Find x in terms of a, b, and c such that
$$(\log_a c)(\log_b a) + (\log_c b)(\log_a c) = 2\log_a x.$$

Problem 8. Consider the function
$$f(x) = 3^{2-x} + 5.$$
Find the x and y intercepts of f.

Problem 9. Consider the function
$$f(x) = 3 - \log_3(x-4).$$
Find the x and y intercepts of f.

Problem 10. If \$1000 is invested at 2.7% compounded quarterly, what is the value of the investment after 7 years?

Problem 11. Suppose $\log_b 16807 = \log_3 243$. Find b.

Problem 12. A circle of radius 11 admits an arc of length 5. Find the corresponding central angle.

Problem 13. The area of a sector of a circle with angle $53°$ is 1.23. Find the radius of the circle.

Problem 14. A circular arc of length $s = 14$ has central angle $\theta = 120°$. Find the radius r of the circle.

Problem 15. A circular sector with area $A = 5\pi$ has central angle $\theta = 36°$. Find the radius r of the circle.

Problem 16. A triangle has angles α, β, and γ, with opposites sides of length a, b, and c. Let $a = 5$, $b = 7$, and $\beta = 48°$. Find α and c.

Problem 17. A triangle has angles α, β, and γ, with opposites sides of length a, b, and c. Let $a = 5$, $b = 7$, and $c = 9$. Find α and β.

Problem 18. Dick van Dyke is flying a kite, which makes an angle of $35°$ with the ground. If the kite has an altitude of 100 feet, how long is the string?

Problem 19. A culture starts with 7530 bacteria. After one hours, the count is 12200.

(a) Find a function that models the number of bacteria $A(t)$ after t hours.

(b) Find the number of bacteria after 3 hours.

(c) After how many hours will the number of bacteria double?

Problem 20. If a radioactive material has a half-life of h, and the amount at time zero is A_0, then the amount at time t is

$$A(t) = A_0 \left(\frac{1}{2}\right)^{t/h}.$$

In 1992, an evil dictator smuggled in 9.6 kilograms of radioactive delusium. After 12 years (in 2004), conquering armies found that only 0.3 kilograms remained. How much delusium actually existed when the intelligence report was forged in 2001?

(a) Find h; how long does it take for half of the material to decay?

(b) Write the function $A(t)$ using the values for A_0 and h.

(c) Use $A(t)$ to answer the question.