CHAPTER 9 Practice Test

1. Write $3^7 = 2187$ in logarithmic form.
2. Write $\log_8 16 = \frac{4}{3}$ in exponential form.
3. Express $\log_3 5$ in terms of common logarithms. Then approximate its value to four decimal places.
4. Evaluate $\log_2 \frac{1}{32}$.

Use $\log_4 7 \approx 1.4037$ and $\log_4 3 \approx 0.7925$ to approximate the value of each expression.

5. $\log_4 21$
6. $\log_4 \frac{7}{12}$

Simplify each expression.

7. $\left(3\sqrt{8}\right)^{\sqrt{2}}$
8. $81^{\sqrt{5}} \div 3^{\sqrt{5}}$

Solve each equation or inequality. Round to four decimal places if necessary.

9. $27^{2p+1} = 3^{4p-1}$
10. $\log_m 144 = -2$
11. $\log_3 3^{(4x-1)} = 15$
12. $4^{2x-3} = 9^{x+3}$
13. $2e^{3x} + 5 = 11$
14. $\log_2 x < 7$
15. $\log_9 (x + 4) + \log_9 (x - 4) = 1$
16. $\log_2 5 + \frac{1}{3} \log_2 27 = \log_2 x$

COINS For Exercises 17 and 18, use the following information.
You buy a commemorative coin for $25. The value of the coin increases at a rate of 3.25% per year.

17. How much will the coin be worth in 15 years?
18. After how many years will the coin have doubled in value?

19. **MULTIPLE CHOICE** The population of a certain country can be modeled by the equation $P(t) = 40\, e^{0.02t}$, where P is the population in millions and t is the number of years since 1900. When will the population be 400 million?

    A 1946 **C** 2015

    B 1980 **D** 2045

STARS For Exercises 20–22, use the following information.
Some stars appear bright only because they are very close to us. Absolute magnitude M is a measure of how bright a star would appear if it were 10 parsecs, about 32 light years, away from Earth. A lower magnitude indicates a brighter star. Absolute magnitude is given by $M = m + 5 - 5 \log d$, where d is the star's distance from Earth measured in parsecs and m is its apparent magnitude.

Star	Apparent Magnitude	Distance (parsecs)
Sirius	−1.44	2.64
Vega	0.03	7.76

20. Sirius and Vega are two of the brightest stars. Which star appears brighter?
21. Find the absolute magnitudes of Sirius and Vega.
22. Which star is actually brighter? That is, which has a lower absolute magnitude?

23. **MULTIPLE CHOICE** Humans have about 1,400,000 hairs on their head and lose an average of 75 hairs each day. If a person's body were to *never* replace a hair, approximately how many years would it take for a person to have 1000 hairs left on their head? (Assume that a person can live significantly longer than the average life span.)

    F 85 years **H** 257 years

    G 113 years **J** 511 years

24. **DINOSAURS** A paleontologist finds that the Carbon-14 found in the bone is $\frac{1}{12}$ of that found in living bone tissue. Could this bone have belonged to a dinosaur? Explain your reasoning. (*Hint:* The dinosaurs lived from 220 million to 63 million years ago.)

25. **HEALTH** Radioactive iodine is used to determine the health of the thyroid gland. It decays according to the equation $y = ae^{-0.0856t}$, where t is in days. Find the half-life of this substance.