6-. The speed of sound, v, at temperature T, in degrees Kelvin, is represented by the equation $v = 1087\sqrt{\frac{T}{273}}$. Which expression is equivalent to $\log v$?

(1) $1087 + \frac{1}{2}\log T - \log 273$

(2) $1087(\frac{1}{2}\log T - \frac{1}{2}\log 273)$

(3) $\log 1087 + \frac{1}{2}\log T - \frac{1}{2}\log 273$

(4) $\log 1087 + 2\log(T + 273)$

12. If $\log x = a$, $\log y = b$, and $\log z = c$, then $\log \frac{x^2 y}{\sqrt{z}}$ is equivalent to

(1) $42a + b + \frac{1}{2}c$ (3) $a^2 + b - \frac{1}{2}c$

(2) $2ab - \frac{1}{2}c$ (4) $2a + b - \frac{1}{2}c$

$\log \frac{x^2 y}{\sqrt{z}} = 2\log x + \log y - \frac{1}{2}\log z$

$2a + b - \frac{1}{2}c$

15. The expression $(\frac{3}{4})^2 \bullet (\frac{1}{4})^{-2}$ is equivalent to

(1) $\frac{9}{16}$ (2) 3 (3) $\frac{9}{256}$ (4) 9

$\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{1}{\frac{1}{4^2}} = 9$

16. If $\log_5 x = 2$, what is the value of $\sqrt{x}$?

(1) $2^{\frac{2}{5}}$ (2) $\sqrt{5}$ (3) 5 (4) 25

$5^2 = x = 25 \quad \sqrt{25} = 5$

17. What is the value of x in the equation $81^{x+2} = 27^{5x+4}$?

$3^{4(x+2)} = 3^{3(5x+4)}$

$4x + 8 = 15x + 12$

$-12 \quad -4x \quad -12$

$-4 = 11x$

$x = -4/11$

18. In the equation $\log_x 4 + \log_x 9 = 2$, x is equal to

(1) $\sqrt{13}$ (2) 6 (3) 6.5 (4) 18

$\log_x (4)(9) = 2 \quad \log_{2x} 36 = 2$

$x = 36 = x = 6$

19. Solve for x: $\log_3(x^2 - 4) - \log_3(x + 2) = 2$

$\log_3 \frac{x^2 - 4}{x + 2} = \log_3 3^2$

$\frac{x^2 - 4}{x + 2} = 9$

$x^2 - 4 = 9(x + 2)$

$x^2 - 4 = 9x + 18 = x^2 - 9x - 22 = 0$

$x^2 - 9x - 22 = 0$

$(x - 11)(x + 2) = 0$

$x = 11 \quad x = -2$ reject

20. Using logarithms, solve the equation $4^x = 70$ for x to the nearest tenth.

$x \log 4 = \log 70$

$\frac{\log 4}{\log 4} \quad \frac{\log 4}{\log 4}$

$x = 3.0646 \rightarrow 3.1$

Check $4^{3.0646} = 69.9959$

21. On January 1, 1999, the price of gasoline was $1.39 per gallon. If the price of gasoline increased by 0.5% per month, what was the cost of one gallon of gasoline, to the *nearest cent*, on January 1 one year later?

$\frac{.5\%}{100} = .005$

$y = ab^x$

$= 1.39(1 + .005)^{12}$

$(1.005)^{12}$

1.06167

1.4757

growth rate

$= \$1.48$ per gallon

22. A used car was purchased in July 1999 for $18,000. If the car depreciates 10.5% of its value each year, what is the value of the car, to the *nearest hundred dollars*, in July 2009?

decay rate

$y = 18000(1 - .105)^{10}$

$= 18000(.895)$

5936.112

$\$5900.00$