Skill Builder Questions

No Calculator:

⑩ a. $9^x - 6(3^x) + 8 = 0$

$(3^x)^2 - 6(3^x) + 8 = 0$

$w^2 - 6w + 8 = 0$

$(w-4)(w-2) = 0$

$(3^x - 4)(3^x - 2) = 0$

$3^x = 4 \quad 3^x = 2$

$\log_3 4 = x \quad \log_3 2 = x$

$\boxed{1.26 = x} \quad \boxed{.631 = x}$

b. $8^{2x-3} = 16^{2-x}$

$(2^3)^{2x-3} = (2^4)^{2-x}$

$2^{6x-9} = 2^{8-4x}$

$6x - 9 = 8 - 4x$

$10x = 17$

$\boxed{x = 1.7}$

⑪ a. $\log_5 (2x-1) = -1$

$5^{-1} = 2x - 1$

$\frac{1}{5} = \frac{2x-1}{1}$

$10x - 5 = 1$

$10x = 6$

$\boxed{x = \frac{6}{10} = \frac{3}{5}}$

b. $25^x - 5^{x+1} + 6 = 0$

$(5^x)^2 - 5^x \cdot 5^1 + 6 = 0$

$(5^x)^2 - 5(5^x) + 6 = 0$

$w^2 - 5w + 6 = 0$

$(w-3)(w-2) = 0$

$(5^x - 3)(5^x - 2) = 0$

$5^x = 3 \quad 5^x = 2$

$\log_5 3 = x \quad \log_5 2 = x$

$\boxed{.683 = x} \quad \boxed{.431 = x}$

⑫ a. $4^x + 4 = 17(2^{x-1})$

$4^x - 17(2^{x-1}) + 4 = 0$

$(2^x)^2 - 17(2^x \cdot 2^{-1}) + 4 = 0$

$(2^x)^2 - 17(2^x \cdot \frac{1}{2}) + 4 = 0$

$(2^x)^2 - \frac{17}{2}(2^x) + 4 = 0$

$w^2 - \frac{17}{2}w + 4 = 0$

$2w^2 - 17w + 8 = 0$

$(2w-1)(w-8) = 0$

$(2(2^x) - 1)(2^x - 8) = 0$

$2^x = \frac{1}{2} \quad 2^x = 8$

$\boxed{x = -1, 3}$

b. $\log_3 x + \log_3 (x-2) = 1$

$\log_3 (x^2 - 2x) = 1$

$3^1 = x^2 - 2x$

$0 = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

$x = 3, \cancel{-1}$

(13) a. $\frac{1}{4}\log 81 + \log 12 - \log 4$

$= \log 81^{1/4} + \log 12 - \log 4$

$= \log 3 + \log 12 - \log 4$

$= \log\left(\frac{3 \cdot 12}{4}\right) = \boxed{\log 9}$

b. $\log_a(5a) =$

$\log_a 5 + \log_a a =$

$\boxed{x + 1}$

c. $\log_a N = 2\log_a d - \log_a c$

$\log_a N = \log_a d^2 - \log_a c$

$\log_a N = \log_a\left(\frac{d^2}{c}\right)$

$$\boxed{N = \frac{d^2}{c}}$$

(14) a. $\log_{10}(P^2 Q\sqrt{R}) =$

$\log_{10} P^2 + \log_{10} Q + \log_{10} R^{1/2} =$

$2\log_{10} P + \log_{10} Q + \frac{1}{2}\log_{10} R =$

$\boxed{2A + B + \frac{1}{2}C}$

b. *use change of base formula*

$\frac{8}{\frac{\log_3 9}{\log_3 5}} = 8 \cdot \frac{\log_3 5}{\log_3 9} = \frac{8\log_3 5}{2}$

$= \boxed{4\log_3 5}$

Calculator Active:

(13) a. 40 amps

b. $40e^{(-.1)(100)} = .002$ amps

c. skip

d. $1 = 40e^{-.1t}$

$\frac{1}{40} = e^{-.1t}$

$e^{-.1t} = \frac{1}{40}$

$\log_e \frac{1}{40} = -.1t$

$\boxed{t = 36.9 \text{ milliseconds}}$

(14) a. $5(2^x) = 160$

$2^x = 32$

$\boxed{x = 5}$

b. $(1.25)^x = 10$

$\log_{1.25} 10 = x$

$\boxed{10.3 = x}$

c. $7e^x = 100$

$e^x = \frac{100}{7}$

$\log_e \frac{100}{7} = x$

$\boxed{2.666 = x}$

(15) a. $200e^{\frac{1}{4}t} = 1500$

$e^{\frac{1}{4}t} = 7.5$

$\log_e 7.5 = \frac{1}{4}t$

$\boxed{8.06 = t}$

b. $200 = 125e^{(-k)(3)}$

$1.6 = e^{-3k}$

$e^{-3k} = 1.6$

$\log_e 1.6 = -3k$

$\boxed{-.157 = k}$

(16) a. $K(0) = 3200(.85)^0 = 3200$ Kangaroos

b. $K(5) = 3200(.85)^5 = 1419$ kangaroos

c. $N(5) = 2400 + 250(5) = 3650$ Koalas

d. $1000 = 3200(.85)^t$

$.3125 = .85^t$

$.85^t = .3125$

$\log_{.85} .3125 = t$

$\boxed{7.16 = t}$

e. Graph & find intersection : $t = 1.10$ years