Algebra II Practice F.LE.A.4: Exponential Growth and Decay

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NAME:_____

1. The half-life of carbon-14 is 5700 years. Find the age of a sample at which 13% of the radioactive nuclei originally present have decayed.

   [A] 1245 years [B] 1145 years

   [C] 2145 years [D] 1695 years

2. The half-life of carbon-14 is 5700 years. Find the age of a sample at which 25% of the radioactive nuclei originally present have decayed.

   [A] 2366 years [B] 3366 years

   [C] 2916 years [D] 2466 years

3. The function $y = 400(1.03)^x$ models the kindergarten population *y* of an elementary school *x* years after the year 2000. Graph the function on your graphing calculator. Estimate when the kindergarten population will reach 500.

4. A forest is losing trees at the rate of 15% per year. After how many years will the forest be reduced to 25% of its current size?

5. Find the pH level to the nearest tenth of a liquid if its [H+] is about 2.8×10^{-8} $\left(\text{H}+ = \left(\frac{1}{10}\right)^{\text{pH}}\right)$.

6. The number of bacteria present in a culture after t minutes is given as $B = 10e^{kt}$. If there are 3527 bacteria present after 3 minutes, find k.

   [A] 17.597 [B] 1.943

   [C] 1.955 [D] 5.866

7. The number of bacteria present in a culture after t minutes is given as $B = 100e^{kt}$. If there are 9790 bacteria present after 7 minutes, find k.

   [A] 32.088 [B] 0.764

   [C] 0.655 [D] 4.584

8. A certain radioactive material decays according to the law $A = A_0e^{-0.021t}$, where A_0 is the initial amount present and A is the amount present in t years. What is the half-life of this material? Round the answer to two decimal places.

   [A] 66.01 years [B] 95.24 years

   [C] 33.01 years

   [D] impossible to determine without knowing A_0

9. A certain radioactive material decays according to the law $A = A_0e^{-0.0343t}$, where A_0 is the initial amount present and A is the amount present in t years. What is the half-life of this material? Round the answer to two decimal places.

   [A] 58.31 years [B] 20.21 years

   [C] 40.42 years

   [D] impossible to determine without knowing A_0

10. Newton's Law of Cooling is given by the function, $T(t) = T_r + (T_i - T_r)e^{kt}$, where $T(t)$ is the temperature of a heated substance *t* minutes after it has been removed from a heat (or cooling) source. T_i is the substance's initial temperature, *k* is a constant for that substance, and T_r is room temperature.

    The initial temperature of a roast beef is 240° F, room temperature is 70°, and $k = -0.041$. How long will it take to cool to within one degree of room temperature?

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[1] B

[2] A

[3] in about $7\frac{1}{2}$ years after the year 2000

[4] After $8\frac{1}{2}$ years the forest will be 25% of what it is now.

[5] 7.6

[6] C

[7] C

[8] C

[9] B

[10] $t = 125$ min