NAME:_____________________________

A2.A.6: Solve an application which results in an exponential function

1. 010230b, P.I. A2.A.6
Depreciation (the decline in cash value) on a car can be determined by the formula $V = C(1-r)^t$, where V is the value of the car after t years, C is the original cost, and r is the rate of depreciation. If a car's cost, when new, is $15,000, the rate of depreciation is 30%, and the value of the car now is $3,000, how old is the car to the *nearest tenth of a year*?

2. 080132b, P.I. A2.A.6
The amount A, in milligrams, of a 10-milligram dose of a drug remaining in the body after t hours is given by the formula $A = 10(0.8)^t$. Find, to the *nearest tenth of an hour*, how long it takes for half of the drug dose to be left in the body.

3. 010429b, P.I. A2.A.6
The equation for radioactive decay is $p = (0.5)^{\frac{t}{H}}$, where p is the part of a substance with half-life H remaining radioactive after a period of time, t. A given substance has a half-life of 6,000 years. After t years, one-fifth of the original sample remains radioactive. Find t, to the *nearest thousand years*.

4. 060431b, P.I. A2.A.6
An archaeologist can determine the approximate age of certain ancient specimens by measuring the amount of carbon-14, a radioactive substance, contained in the specimen. The formula used to determine the age of a specimen is $A = A_0 2^{\frac{-t}{5760}}$, where A is the amount of carbon-14 that a specimen contains, A_0 is the original amount of carbon-14, t is time, in years, and 5760 is the half-life of carbon-14. A specimen that originally contained 120 milligrams of carbon-14 now contains 100 milligrams of this substance. What is the age of the specimen, to the *nearest hundred years*?

5. 010632b, P.I. A2.A.6
The current population of Little Pond, New York, is 20,000. The population is *decreasing*, as represented by the formula $P = A(1.3)^{-0.234t}$, where P = final population, t = time, in years, and A = initial population. What will the population be 3 years from now? Round your answer to the *nearest hundred people*. To the *nearest tenth of a year*, how many years will it take for the population to reach half the present population? [The use of the grid is optional.]

A2.A.6: Solve an application which results in an exponential function

[4] 4.5, and appropriate work is shown, such as using logs to solve the equation $0.2 = 0.7^t$.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Substitution with $r = 30$ is shown and the log of both sides is determined, but the domain error is not recognized, such as $\log 0.2 = t\log(-29)$.
or [2] The order of operations is used incorrectly and an exponential function is maintained, but t is solved for appropriately, using logs.
[1] Substitution with $r = 0.3$ is shown, resulting in $0.2 = 0.7^t$, but no further work is shown.
or [1] 4.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[1] incorrect procedure.

[4] 3.1, and appropriate work is shown, such as $5 = 10(0.8)^t$.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] An incorrect value for A is used, but the equation is solved appropriately.
[2] An incorrect value for A is used, but the equation is solved appropriately, but one computational or rounding error is made.
[1] 3.1, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[2] incorrect procedure.

[4] 14,000, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] A correct equation such as $\log\frac{1}{5} = (\frac{t}{6{,}000})\log 0.5$ is written, but no further correct work is shown.
[1] The correct substitutions are made, but no further correct work is shown.
or [1] 14,000, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[3] incorrect procedure.

[4] 1,500, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] A correct equation is written, but no further correct work is shown.
or [1] 1,500, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[4] incorrect procedure.

[4] 16,600 and 11.3, and appropriate work is shown.
[3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
[2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] Either 16,600 or 11.3 is found, and appropriate work is shown, but the other answer is not found.
[1] Appropriate work is shown, but one conceptual error and one computational, rounding, or graphing error are made.
or [1] Correct substitutions are made into both formulas, but no further correct work is shown.
or [1] 16,600 and 11.3, but no work is shown.
[0] 16,600 or 11.3, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[5] obviously incorrect procedure.