

NAME: \_\_\_\_\_

1. 010230b, P.I. A2.A.27

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.27

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.27

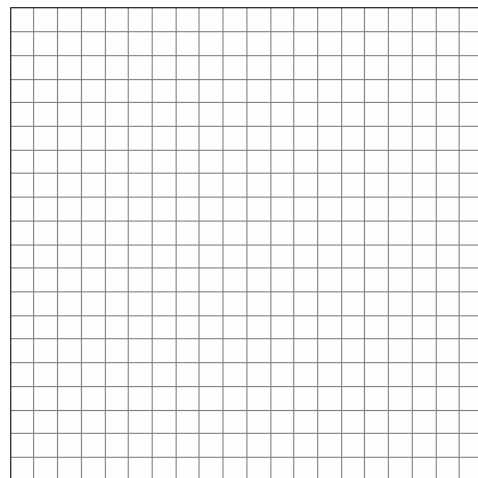
The equation for radioactive decay is  $p = (0.5)^{\frac{t}{H}}$ , where  $p$  is the part of a substance with half-life  $H$  remaining radioactive after a period of time,  $t$ . A given substance has a half-life of 6,000 years. After  $t$  years, one-fifth of the original sample remains radioactive.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

4. 060431b, P.I. A2.A.27

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.27

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.]



[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

$$\log \frac{1}{5} = \left( \frac{t}{6,000} \right) \log 0.5 \text{ is written, but no}$$

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.

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