5.6 Exponential & Logarithmic Models

2022-2023

SCORE:

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Name _____ **Date** _____ **Period** _____

Use the simple interest formula to answer the following. (I = Prt)

1. What is the interest due if $500 is borrowed for 6 months at a simple interest rate of 6% per annum?

2. If you borrow $5,000 and, after 9 months pay off the loan in the amount of $5,500, what per annum rate of interest was charged?

3. The total amount borrowed on a loan is called the _____.

4. In working problems involving interest, if the payment period of the interest is quarterly, the interest is paid _____ times a year.

Applications

5. If Tanisha has $100 to invest at 8% per annum compounded monthly, how long will it be before she has $150? If the compounding is continuous, how long will it be?

6. A department store charges 12.5% per month on the unpaid balance for customers with charge accounts (interest is compounded monthly). A customer charges $200 and does not pay off her bill until 6 months later. How much did she pay at the end of the 6 months?

7. John requires $3000 in 6 months to pay off a loan that has no prepayment privileges. How much principal should he save in an account paying 3% compounded monthly so that in 6 months he will have exactly $3000?

8. Jim places $1000 in a bank account that pays 5.6% compounded continuously. After 1 year, will he have enough money to buy a computer system that costs $1060? If another bank will pay Jim 5.9% compounded monthly, is this a better deal?

Growth & Decay Applications

9. The size P of a certain insect population at time t (in days) obeys the function $P(t) = 500e^{0.02t}$.

a) Determine the number of insects a t = 0 days.

b) What is the growth rate of the insect population?

c) What is the population after 10 days?

d) When will the population reach 800? Round to the nearest tenth.

e) When will the insect population double? Round to the nearest tenth.

10. Strontium 90 is a radioactive material that decays according to the function $A(t) = A_0 e^{-0.0244t}$, where A_0 is the initial amount present and A is the amount present at time t (in years). Assume that a scientist has a sample of 500 grams of strontium 90.

a) What is the decay rate of strontium 90?

b) How much strontium 90 is left after 10 years? Round to the nearest hundredth.

c) When will 400 grams of strontium 90 be left? Round to the nearest tenth.

d) What is the half-life of strontium 90? Round to the nearest tenth.

11. The population of a colony of mosquitos obeys the law of uninhibited growth.

a) If N is the population of the colony and t is the time in days, express N as a function of t.

b) If there are 1000 mosquitoes initially and there are 1800 after day 1, what is the size of the colony after 3 days?

c) How long is it until there are 10,000 mosquitoes? Round to the nearest tenth.

12. The population of a southern city follows the exponential law.

a) If N is the population of the city and t is the time in years, express N as a function of t.

b) If the population doubled in size over an 18-month period and the current population is 10,000, what will the population be 2 years from now?

13. The population of a Midwestern city follows the exponential law.

a) If N is the population of the city and t is the time in years, express N as a function of t.

b) If the population decreased from 900,000 to 800,000 from 2008 to 2010, what will the population be in 2012?

14. The half-life of radioactive potassium is 1.3 billion years. If 10 grams is present now, how much will be present in 100 years? In 1000 years?

15. A fossilized leaf contains 70% of its normal amount of carbon 14. How old is the fossil? (The half-life of carbon 14 is 5600 years.)