Write an exponential decay function to model each situation. Then find the value of the function after the given amount of time.

18. The population of a town is 18,000 and is decreasing at a rate of 2% per year; 6 years.

19. The value of a book is $58 and decreases at a rate of 10% per year; 8 years.

20. The half-life of bromine-82 is approximately 36 hours. Find the amount of bromine-82 left from an 80-gram sample after 6 days.

Identify each of the following functions as exponential growth or decay. Then give the rate of growth or decay as a percent.

21. $y = 3(1.61)^t$ **22.** $y = 39(0.098)^t$ **23.** $y = a\left(\frac{2}{3}\right)^t$ **24.** $y = a\left(\frac{3}{2}\right)^t$

25. $y = a(1.1)^t$ **26.** $y = a(0.8)^t$ **27.** $y = a\left(\frac{5}{4}\right)^t$ **28.** $y = a\left(\frac{1}{2}\right)^t$

Write an exponential growth or decay function to model each situation. Then find the value of the function after the given amount of time.

29. The population of a country is 58,000,000 and grows by 0.1% per year; 3 years.

30. An antique car is worth $32,000, and its value grows by 7% per year; 5 years.

31. An investment of $8200 loses value at a rate of 2% per year; 7 years.

32. A new car is worth $25,000, and its value decreases by 15% each year; 6 years.

33. The student enrollment in a local high school is 970 students and increases by 1.2% per year; 5 years.

34. Archaeology Carbon-14 dating is a way to determine the age of very old organic objects. Carbon-14 has a half-life of about 5700 years. An organic object with $\frac{1}{2}$ as much carbon-14 as its living counterpart died 5700 years ago. In 1999, archaeologists discovered the oldest bridge in England near Testwood, Hampshire. Carbon dating of the wood revealed that the bridge was 3500 years old. Suppose that when the bridge was built, the wood contained 15 grams of carbon-14. How much carbon-14 would it have contained when it was found by the archaeologists? Round to the nearest hundredth.


A computer-generated image of what the bridge at Testwood might have looked like

H.O.T. **35. ERROR ANALYSIS** Two students were asked to find the value of a $1000-item after 3 years. The item was depreciating (losing value) at a rate of 40% per year. Which is incorrect? Explain the error.

A

$1000(0.6)^3$

$216

B

$1000(0.4)^3$

$64

H.O.T. **36. Critical Thinking** The value of a certain car can be modeled by the function $y = 20{,}000(0.84)^t$, where t is time in years. Will the value ever be zero? Explain.

37. The value of a rare baseball card increases every year at a rate of 4%. Today, the card is worth $300. The owner expects to sell the card as soon as the value is over $600. How many years will the owner wait before selling the card? Round your answer to the nearest whole number.