

Section 9.6 day 3  
Algebra 2 Trig HW

Name Key

Directions: Round to the nearest hundredth. Show calculations ☺

1. A current census shows that the population of a city is 3.5 million. Find the expected population of the city in 30 years if the growth rate of the population is 1.5% per year.

$$y = 3.5(1 + .015)^{30}$$

5.47 million people

2. Mary had \$2,500 to invest in a bank account earning 1.75% interest. If the bank compounds monthly, what is the total amount she will get back in 3.5 years?

n=12

$$y = 2500 \left(1 + \frac{.0175}{12}\right)^{12(3.5)}$$

\$ 2657.79

3. How many hours will it take a culture of bacteria to increase from 20 to 2000 if the growth rate per hour is 85%?

$$\begin{aligned} 2000 &= 20(1 + .85)^t \\ 100 &= 1.85^t \\ \frac{\log 100}{\log 1.85} &= t \end{aligned}$$

7.49 hours

4. A Global Positioning Satellite (GPS) system uses satellite information to locate ground position. Abu's surveying firm bought a GPS system for \$12,500. The GPS depreciated by a fixed rate of 6% per year and is now worth \$8600. How long ago did Abu buy the GPS system?

$$\begin{aligned} 8600 &= 12500(1 - .06)^t \\ .688 &= .94^t \\ \frac{\log .688}{\log .94} &= t \end{aligned}$$

6.04 years

5. For Dave to buy a new car comparably equipped to the one he bought a few years ago would cost \$12,500. Since Dave bought the car, the inflation rate for cars like his has been at an average annual rate of 5.1%. If Dave originally paid \$8,400 for the car, how long ago did he buy it?

$$\begin{aligned} 12500 &= 8400(1 + .051)^t \\ 1.4881 &= 1.051^t \\ \frac{\log 1.4881}{\log 1.051} &= t \end{aligned}$$

7.99 years

6. Jim wanted to invest in a 2 year-CD earning 1.8% interest compounded quarterly. How much money did Jim invest, if he received \$881.09?

n=4

$$\begin{aligned} 881.09 &= P \left(1 + \frac{.018}{4}\right)^{4(2)} \\ 881.09 &= P(1.0366) \end{aligned}$$

\$ 849.98 = P

7. Louisa read that the population of her town has increased steadily at a rate of 2% each year. Today, the population of her town has grown to 68,735. Based on this information, what was the population of her town 100 years ago?

$$68735 = P(1 + .02)^{100}$$

$$68735 = P(7.2446)$$

$$P = \boxed{9488 \text{ people}}$$

8. In an over-fished area, the catch of a certain fish is decreasing at an average rate of 8% per year. If this decline persists, how long will it take for the catch to reach half of the amount before the decline?

$$1 = 2(1 - .08)^t$$

$$.5 = .92^t$$

$$\frac{\log .5}{\log .92} = t$$

$$t = \boxed{8.31 \text{ years}}$$

9. Jane invested \$5,000 in a bank account and received \$5,171.63 when she withdrew her money. If she had a 1.5% interest rate compounded daily, how long did she have the money in her account?

$$5171.63 = 5000 \left(1 + \frac{.015}{365}\right)^{365t}$$

$$1.0343 = 1.00004^{365t}$$

$$843.1386 = 365t$$

$$t = \boxed{2.31 \text{ years}}$$

10. A population of 8,000 people depreciates every decade at the rate of 4.5%.

a. How many people will be in the town in 3 decades?

$$t = 3$$

$$y = 8000(1 - .045)^3$$

$$y = \boxed{6,968 \text{ people}}$$

b. How many people were in the town 50 years ago?

$$t = -5$$

$$y = 8000(1 - .045)^{-5}$$

$$y = \boxed{10,071 \text{ people}}$$

11. A piece of machinery valued at \$250,000 depreciates at a fixed rate of 12% per year. After how many years will the value have depreciated to \$100,000?

$$100000 = 250000(1 - .12)^t$$

$$.4 = .88^t$$

$$\frac{\log .4}{\log .88} = t$$

$$t = \boxed{7.17 \text{ years}}$$

12. How many days will it take a culture of bacteria to increase from 2000 to 50,000 if the growth rate per day is 93.2%?

$$50000 = 2000(1 + .932)^t$$

$$25 = 1.932^t$$

$$\frac{\log 25}{\log 1.932} = t$$

$$t = \boxed{4.89 \text{ days}}$$