

Writing Exponential Equations from Context WS

For each problem, write an exponential equation to model the situation. Then use the equation to answer the question being asked.

1) Bacteria can multiply at an alarming rate when each bacteria splits into two new cells, thus doubling. If we start with only one bacteria which can double every hour, how many bacteria will we have by the end of the day?

$$A = 1(2)^{24}$$

116,777,216 bacteria

2) Bailey invests \$4,848 in a savings account with a fixed annual rate of 5%, compounded twice per year. When will the balance be \$10,000? Round to the nearest year.

$$10,000 = 4848 \left(1 + \frac{.05}{2}\right)^{2t}$$

$$\frac{10000}{4848} = (1.025)^{2t}$$

$$2t = \log_{1.025} \left(\frac{10000}{4848}\right)$$

$$t = \frac{\log\left(\frac{10000}{4848}\right)}{\log 1.025} \div 2$$

15 years

3) Finley invests \$6,154 in a savings account with a fixed annual rate of 4.1%, compounded continuously. What will the account balance be after 10 years? Round to the nearest dollar.

$$A = 6154 e^{.041(10)}$$

\$9,273

4) Ndiba invests a sum of money in a savings account with a fixed annual interest rate of 4.61%, compounded three times per year. After 6 years, the balance reaches \$5,485.85. What was the amount of the initial investment?

$$5485.85 = P \left(1 + \frac{0.0461}{3}\right)^{3(6)}$$

$$P = \frac{5485.85}{\left(1 + \frac{0.0461}{3}\right)^{18}}$$

\$4169

5) Adam invests \$6,139 in a retirement account with a fixed annual interest rate compounded continuously. After 17 years, the balance reaches \$8,624.97. What is the interest rate of the account? Round to the nearest tenth of a percent.

$$8624.97 = 6139 e^{17r}$$

$$\frac{8624.97}{6139} = e^{17r}$$

$$17r = \ln \frac{8624.97}{6139}$$

$$r = \frac{\ln \frac{8624.97}{6139}}{17} \approx 0.01999 \dots$$

2.0%

7) Find a bank account balance if the account starts with \$250, has an annual interest rate of 2.75% compounded quarterly, and the money is left in the account for 15 years. Round to the nearest dollar.

$$A = 250 \left(1 + \frac{0.0275}{4}\right)^{4(15)}$$

\$377

9) Serafina invests \$8,000 in a savings account with a fixed annual rate of 5.4%, compounded continuously. When will he have \$15,000 in his account? Round to the nearest year.

$$15000 = 8000 e^{0.054t}$$

$$e^{0.054t} = 1.875$$

$$t = \frac{\ln 1.875}{0.054}$$

12 years

6) Aut invests \$3,250 in an account with a fixed annual interest rate of 5.2%, compounded daily (do not account for Leap Years at this time). What will the balance of the account be in 20 years? Round to the nearest dollar.

$$A = 3250 \left(1 + \frac{0.052}{365}\right)^{20(365)}$$

\$9194

8) Huong invests \$8,589 in a retirement account with a fixed annual interest rate of 7% compounded continuously. How long will it take for the account balance to be \$21,337.85? Round to the nearest year.

$$21337.85 = 8589 e^{0.07t}$$

$$e^{0.07t} = \frac{21337.85}{8589}$$

$$t = \frac{\ln \left(\frac{21337.85}{8589}\right)}{0.07}$$

13 years

10) Megalopolis has a population of 1,200,000 but is losing 1.1% of its population per year. If this trend continues, what will the population of Megalopolis be in 20 years? Round to the nearest person.

$$1,200,000 e^{-0.011(20)}$$

963,023 people