

MORE PRACTICE - Applications 2

ANSWERS

1. One hundred dollars is invested in a savings account that earns 2% interest annually. How long until you have 300 dollars?

$$\begin{aligned} \$ &= 100(1+0.2)^t & 3 &= 1.02^t \\ 300 &= 100(1.02)^t & t &= \log_{1.02} 3 = \frac{\log 3}{\log 1.02} = 55.5 \text{ years} \end{aligned}$$

2. You want to invest \$500 in the bank. The bank offers an account with an interest rate of 1.53% compounded quarterly. How much money will you have in the bank in 7 years?

$$\begin{aligned} \$ &= 500 \left(1 + \frac{0.0153}{4}\right)^{4t} & \$ &= 500(1.003825)^{28} = \$556.41 \\ \$ &= 500(1.003825)^{4 \cdot 7} \end{aligned}$$

3. You invest \$1000 in a CD. The interest rate is 4%, and the interest is compounded monthly. How long until your CD is worth \$1200?

$$\begin{aligned} 1200 &= 1000 \left(1 + \frac{0.04}{12}\right)^{12t} & 12t &= \log_{1.0033} 1.2 = \frac{\log 1.2}{\log 1.0033} \\ 1.2 &= (1.0033)^{12t} & 12t &= 54.788 \rightarrow t = 4.57 \text{ years} \end{aligned}$$

4. You invest \$100 in an account with a 2.5% interest rate. How long would it take to double your money, if the money is compounded continuously?

$$\begin{aligned} 200 &= 100 e^{0.025t} & .025t &= \ln 2 & 0.025t &= 0.693 \\ 2 &= e^{0.025t} & t &= 27.7 \text{ years} \end{aligned}$$

5. The population of a city is 10000. The population is increasing by 5% per year.

How many people will live in this city in 10 years?

a. Solve using the model: $P = I(1+r)^t = 10000(1+0.05)^{10} = 10000(1.05)^{10} = 16289$ People

b. Solve using the model: $P = Ie^{kt} = 10000e^{kt}$

when $t=1$

$$P = 10000 + (10000 \times 0.05) = 10000 + 500 = 10500$$

So $10500 = 10000e^{k \cdot 1}$ Solving: $1.05 = e^k$
 $k = \ln 1.05 = 0.487$

So $P = 10000e^{0.487 \cdot 10} = 10000e^{4.87} = 16289$ People