MORE PRACTICE: Applications 1

1. A wildfire is burning in, what is roughly, a circle. The fire is currently 100 square feet. The fire is doubling in size every 10 hours. How long until the fire is 1000 square feet?

2. Rutherfordium- 261 has a half-life of 81 seconds. If you have 50 ounces of Ru-261:
a. How much will you have in 1 hour?

b. How long until you have 5 ounce left?

3. The population of Sweden is 9,918,869. It is expected that the population is growing at a rate of 6% annually. How long until the population is 15,000,000?

4. The population of Estonia is 1,305,980. The population of this country is decreasing by 6% every year. How long until the population is 1,000,000?

ANSWERS

MORE PRACTICE: Applications 1

1. A wildfire is burning in, what is roughly, a circle. The fire is currently 100 square feet. The fire is doubling in size every 10 hours. How long until the fire is 1000 square feet?

$F = 100(2)^t$

$1000 = 10(2)^t$

$100 = 2^t$

$t = \log_2 100 = \frac{\log 100}{\log 2} = 6.64$ time increments of 10 hours

So 6.64×10 hours $= 66.4$ hours

2. Rutherfordium- 261 has a half-life of 81 seconds. If you have 50 ounces of Ru-261:

a. How much will you have in 1 hour?

$\text{Stuff} = 50\left(\frac{1}{2}\right)^{t/81} = 50\left(\frac{1}{2}\right)^{\frac{3600}{81}} = 50\left(\frac{1}{2}\right)^{44.\overline{4}} = 2.089 \times 10^{-12}$ ounces

b. How long until you have 5 ounce left?

$5 = 50\left(\frac{1}{2}\right)^{t/81}$

$0.1 = \left(\frac{1}{2}\right)^{t/81} \Rightarrow t/81 = \log_{1/2} 0.1 = \frac{\log 0.1}{\log 0.5} = 3.32$

$\left(\frac{1}{2} = 0.5\right)$

$81 \times t/81 = 3.32$ (×81)

$t = 269$ seconds

3. The population of Sweden is 9,918,869. It is expected that the population is growing at a rate of 6% annually. How long until the population is 15,000,000?

$P = 9918869(1+0.06)^t$

$\frac{15{,}000{,}000}{9918869} = \frac{9{,}918{,}869(1.06)^t}{9918869}$

$1.512 = 1.06^t$

$t = \log_{1.06} 1.512$

$= \frac{\log 1.512}{\log 1.06} = 7.095$ years

4. The population of Estonia is 1,305,980. The population of this country is decreasing by 6% every year. How long until the population is 1,000,000?

$P = 1305980(1-0.06)^t$

$\frac{1000000}{1305980} = \frac{1305980(0.94)^t}{1305980}$

$0.7657 = 0.94^t$

$t = \log_{0.94} 0.7657 = \frac{\log 0.7657}{\log 0.94} = 4.31$ years