

# Solutions

## Chapter 4 More Word Problems

---

1. Suzanne is planning to invest \$ 8000 dollars total into two different certificates of deposit.

A: 4% annual interest rate compounded quarterly

B: 3.75% annual interest rate compounded continuously

Assuming that Suzanne has \$11,741.55 after 10 years, how much did she invest in each certificate?

Suppose Suzanne invests  $x$  into certificate A.

Then she invest  $8000 - x$  into certificate B.

Total after 10 years is

$$11,741.55 = x \left(1 + \frac{0.04}{4}\right)^{4 \cdot 10} + (8000 - x)e^{0.0375 \cdot 10}$$

$$= x(1.01)^{40} + 8000e^{0.375} - xe^{0.375}$$

$$= x(1.4889) + 11,639.931 - x(1.455)$$

$$101.62 = x(1.4889 - 1.455) = x(0.0339)$$

$$x = \$2,997.64 \text{ into A}$$

$$\text{and } \$5,002.36 \text{ into B.}$$

2. Recall that the half-life of carbon-14 is 5730 years, so that the amount of carbon-14 remaining, of a sample of size 100 g, after  $t$  years is given by the formula

$$m(t) = 100\left(\frac{1}{2}\right)^{t/5730}.$$

Find a formula which gives the number of years when  $m$  grams of the sample will be remaining.

We are finding the inverse!!

$$m = 100\left(\frac{1}{2}\right)^{t/5730}$$

$$\frac{m}{100} = \left(\frac{1}{2}\right)^{t/5730}$$

$$\ln\left(\frac{m}{100}\right) = \frac{t}{5730} \ln\left(\frac{1}{2}\right) \Rightarrow t = \frac{5730 \cdot \ln\left(\frac{m}{100}\right)}{\ln\left(\frac{1}{2}\right)}.$$

3. You have a \$50 coupon for the purchase of a cell phone. The store where you are purchasing your cell phone is offering a 20% discount. Let  $x$  represent the sticker price of the cell phone.

- Suppose that only the 20% discount applies. Find a function  $f$  that models the purchase price of the cell phone as a function of the sticker price.
- Suppose that only the \$50 coupon applies. Find a function  $g$  that models the purchase price of the cell phone as a function of the sticker price.
- If you can use the discount and the coupon, then the purchase price is either  $f(g(x))$  or  $g(f(x))$ , depending on the order in which they are applied. Find both and determine which order will give the lower price.

$$(a) f(x) = 0.8x$$

$$(b) g(x) = x - 50$$

$$(c) f(g(x)) = f(x - 50) = 0.8(x - 50) = 0.8x - 40$$

$$g(f(x)) = g(0.8x) = 0.8x - 50$$

Clearly, applying the 20% discount first gives a lower price.