3.7 Practice Key

Practice 3.7-1-1:

Using the Compound Interest Formula to Solve for the Principal

A 529 Plan is a college-savings plan that allows relatives to invest money to pay for a child's future college tuition; the account grows tax-free. Lily wants to set up a 529 account for her new granddaughter and wants the account to grow to $40,000 over 18 years. She believes the account will earn 6% compounded semi-annually (twice a year). To the nearest dollar, how much will Lily need to invest in the account now?

Solution

The nominal interest rate is 6%, so $r = 0.06$. Interest is compounded twice a year, so $n = 2$.

We want to find the initial investment, P, needed so that the value of the account will be worth $40,000 in 18 years. Substitute the given values into the compound interest formula, and solve for P.

	$A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$	Use the compound interest formula.
40,000	$= P\left(1 + \frac{0.06}{2}\right)^{2(18)}$	Substitute using given values $A, r, n,$ and t.
40,000	$= P(1.03)^{36}$	Simplify.
$\frac{40{,}000}{(1.03)^{36}}$	$= P$	Isolate P.
	$P \approx \$13{,}801$	Divide and round to the nearest dollar.

Lily will need to invest $13,801 to have $40,000 in 18 years.

Practice 3.7-2-1:

Keep 4 decimal places.

Calculating Continuous Decay

Radon-222 decays at a continuous rate of 17.3% per day. How much will 100 mg of Radon-222 decay to in 3 days?

Solution:

Since the substance is decaying, the rate, 17.3%, is negative. So, $r = -0.173$. The initial amount of radon-222 was 100mg, so $a = 100$. We use the continuous decay formula to find the value after $t = 3$ days:

$A(t) = ae^{rt}$	Use the continuous growth formula.
$= 100e^{-0.173(3)}$	Substitute known values for a, r,and t.
$\approx \$13{,}801$	Use a calculator to approximate.

So 59.5115 mg of radon-222 will remain.