Trust Fund *Grandparents decide to put a lump sum of money into a trust fund on their granddaughter's 10th birthday so that she will have $1,000,000 on her 60th birthday. If the fund pays 11%, compounded monthly, how much money must they put in the account?* [1]

To find such a value we use this formula:

Future Value of an Investment with Periodic Compounding

If P dollars are invested for t years at the annual interest rate r, where the interest is compounded k times per year, then the interest rate per period is $\frac{r}{k}$, the number of compounding periods is kt, and the future value that results is given by

$$S = P\left(1 + \frac{r}{k}\right)^{kt} \text{ dollars}$$

We have been given the following:

- The future value, $S = 1{,}000{,}000$.
- The annual interest rate written as a decimal, $r = 0.11$.
- We are compounding monthly so the number of compoundings per year is $k = 12$.
- Because the difference between the granddaughter's 10th and 60th birthdays is 50 years, the number of years for the money to be invested is $t = 50$.

We'll plug these values into the formula and to solve for P which represents the amount of the original investment.

$$\begin{aligned}
S &= P\left(1 + \frac{r}{k}\right)^{kt} \\
1{,}000{,}000 &= P\left(1 + \frac{0.11}{12}\right)^{(12\cdot 50)} \\
1{,}000{,}000 &= P\left(1.00916667\right)^{(600)} \\
1{,}000{,}000 &= P\left(238.6373092\right) \\
\frac{1{,}000{,}000}{238.6373092} &= P \\
4190.459587 &= P
\end{aligned}$$

The grandparents must put $4190.46 into the granddaughters account on her 10th birthday.

[1] Harshbarger/Yocco, *College Algebra In Context, 5e*, p. 385, #42.