1. You will need $2400 in cash two years from now. Your parents tell you that if you give them some amount of money now, they will pay you 10% annual simple interest on it, with no compounding. How much money do you need to give them in order to have the $2400 in two years?

Solution: First, we recall that for simple interest, \( F = P(1 + r \cdot t) \). In our case, we know the future value \( F \) is $2400, that the annual rate is 10%, and the time is 2 years. We want to know the principle \( P \). Since both the rate and the time are given in years, all our units match and there is no need for conversion. Thus, we need to solve

\[
2400 = P(1 + (.10)(2)) = 1.2P
\]

for \( P \), giving

\[
P = \frac{2400}{1.2} = 2000
\]

So we need to give them $2000 now to have $2400 in two years.

2. If you invest $1000 in a bank account that pays 8% annual interest, compounded monthly, how much will there be in the account after 3 years?

\[
\begin{align*}
$1000 \left(1 + \frac{8}{12}\right)^3 & \quad $1000 \left(1 + .08\right)^{36} & \quad $1000 \left(1 + \frac{.08}{12}\right)^{36} \\
\quad & \quad \quad & \quad \quad \\
$ \left(1000 + \frac{.08}{12}\right)^3 & \quad $1000 + \left(\frac{.08}{12}\right)^{36} & \quad $1000 \left(\frac{8}{12}\right)^3 \\
\quad & \quad \quad & \quad \quad \\
$1000 \left(1 + \frac{.08}{12}\right)^{36} & \quad 1000 \left(1 + \frac{.08}{12}\right)^{36} & \quad 1000 \left(1 + \frac{.08}{12}\right)^{36}
\end{align*}
\]

Solution: Our principle is $1000. Since the account is compounded monthly, our periodic interest rate is \( \frac{.08}{12} \) (there are 12 months in a year). We also need to express our time in months, and 3 years is 36 months. Thus, the amount is expressed as

\[
1000 \left(1 + \frac{.08}{12}\right)^{36}
\]

3. If you invest $1000 at 8% annually, compounded monthly, how many months will it be until you double your money?

\[
\begin{align*}
\log (1000) \left(1 + \frac{.08}{12}\right) & \quad \log (2000) \left(1 + \frac{.08}{12}\right) & \quad \log (2) \\
\log (1000) & \quad \log (1 + \frac{.08}{12}) & \quad \log (1 + \frac{.08}{12}) \\
\log \left(1 + \frac{.08}{12}\right) & \quad \sqrt{1000 + \frac{.08}{12}} & \quad \frac{1}{12} \log \left(1 + \frac{.08}{12}\right)
\end{align*}
\]
Solution: Since we want to double our money, the future value should be $2000. As above, the periodic rate is $\frac{0.08}{12}$, the principle is $1000$, and the time is in months. Thus, we need to solve

$$2000 = 1000 \left(1 + \frac{0.08}{12}\right)^t$$

for $t$. First, divide both sides by 1000 to get

$$2 = \left(1 + \frac{0.08}{12}\right)^t$$

and then take the logarithm of both sides. Using the fact that $\log (b^x) = x \log b$, we get

$$\log 2 = t \log \left(1 + \frac{0.08}{12}\right)$$

Now divide to get

$$t = \frac{\log 2}{\log \left(1 + \frac{0.08}{12}\right)}$$

This is 104.31 months, that is, just over 8 years and 8 months.

(Note that on the original quiz, the correct answer had a typo, so everyone got full credit on this problem, no matter which choice they picked. Duh.)