PENFED CREDIT UNION

Name: _____ Date: _____

Calculating Simple and Compound Interest

The Simple Interest Formula

Simple interest is based on a percentage of the principal borrowed. You can calculate it using the following formula:

Simple Interest: $SI = P \times r \times r$
SI = Simple Interest
P = Principal (amount borrowed or invested)
r = rate of interest
t = time (how many years you borrow the money for)
Note: For time less than a year, use a decimal. Ex: 6 months is half of a year, or 0.5

Let's look at an example. Say you borrowed $800 and agreed to repay that amount at 6% simple interest in 1 year.

It's good to first list the values for each variable in the formula. Here, **P = $800**, **$r$ = 6% = 0.06**, and **t = 1 year**. So, you'd end up with:

SI = $800 × .0.06% × 1
SI = $48 × 1
SI = $48

This shows us that it costs $48 for you to borrow $800 for one year with these terms. If you borrowed the money for two years under the same conditions, you would owe twice that amount, or $96 in interest.

The Compound Interest Formulas

Compound interest is based on a percentage of the principal borrowed, plus the accrued interest. You can calculate it using the following formula:

Compound Interest: $CI = P\left(1 + \frac{r}{n}\right)^{nt} - P$

P = Principal (amount borrowed or invested)
r = rate of interest
n = number of times the interest is compounded every year
t = time (number of years you borrow the money for)

Here's an example of how the formula works. You get $200 for your birthday and decide to put it into a high-yield savings account earning 3% compounded monthly. How much will you earn in 4 years?

The compound interest formula might look a bit complex. But we'll do some initial calculations first, in order to make the final calculations easier.

Step 1: Convert the annual interest rate (3%, or 0.03) to a monthly rate:

$$\frac{r}{n} = \frac{0.03}{12} = 0.0025$$

Step 2: Calculate your exponent. (number of times interest is compounded × number of years.)

$$nt = 12 \times 4 = 48$$

Step 3: Insert your calculations for $\frac{r}{n}$ and nt into the formula, along with the original amount (principal), $P = 200$.

$$A = CI = \$200\ (1 + 0.0025)^{48}$$

Step 4: Use the order of operations (PEMDAS) to solve your equation.

$$CI = 200\ (1 + 0.0025)^{48} - 200$$
$$CI = 200\ (1.0025)^{48} - 200\ (\textit{parentheses})$$
$$CI = 200\ (1.127328) - 200\ (\textit{exponent})$$
$$CI = 225.47 - 200\ (\textit{multiply})$$
$$CI = 25.47\ (\textit{subtract})$$

At the end of 4 years, you'll have earned $25.47. And you'll have a total of $225.47 in your account — the original $200 plus $25.47 in interest.

Check Your Understanding

Using the formulas above, find the answer for each of the following problems

1. **Sara is investing $250 in a certificate at 5.4% simple interest. How much will she earn when it matures in 18 months?**
2. **Juan is buying his first car. He's offered a loan of $20,000 at 11.91% simple interest for 36 months. How much will he pay in interest?**
3. **Maya has $500 to invest. Credit union A offers a simple interest rate of 5%. Credit union B offers an account with a 4.75% rate, compounded monthly. Which account would help him earn the most money over a period of 4 years?**

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Check Your Understanding Answers

1. **$20.25**
2. **$7,146.00**
3. **Interest earned:**
   Credit union A: $100; credit union B: $104.40
   Credit union B will return $4.40 more in 4 years.