

Simple Interest, Compound Interest

What is
interest?

Simple Interest

- ▣ **Simple Interest** is always paid on only the initial amount.
- ▣ You deposit \$500 into a savings account. You will earn 3% interest per year. If we are using simple interest, how much money will you have in your bank account after 5 years?

- ❑ Simple interest is **not** very common.
- ❑ If you put money in a bank account and you only get interest on the original amount, you don't get as much money. Who can explain why?

Compound Interest

- **Compound Interest** is paid on the initial amount *and* interest already earned in the past.
- You deposit \$500 into a savings account. You will earn 3% interest per year. If we are using **compound** interest, how much total money would you have in your bank account after 5 years?

Compound Interest

- You deposit \$500 into a savings account. You will earn 3% interest per year, twice a year. If we are using **compound** interest, how much total money would you have in your bank account after 5 years?

Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A represents the balance after t years.

P represents the principal, or original amount.

r represents the annual interest rate expressed as a decimal.

n represents the number of times interest is compounded per year.

t represents time in years.

Reading Math

For compound interest

- *annually* means “once per year” ($n = 1$).
- *quarterly* means “4 times per year” ($n = 4$).
- *monthly* means “12 times per year” ($n = 12$).

Write a compound interest function to model each situation. Then find the balance after the given number of years.

**\$1200 invested at a rate of 2%
compounded quarterly; 3 years.**

$$A = P \left(1 + \frac{r}{n} \right)^{4t} = 1200(1.005)^{12}$$

$$= 1200 \left(1 + \frac{0.02}{4} \right)^{4t} \approx 1274.01$$

$$= 1200(1.005)^{4t}$$

The balance after 3 years is \$1,274.01.

Write a compound interest function to model each situation. Then find the balance after the given number of years.

\$15,000 invested at a rate of 4.8% compounded monthly; 2 years.

$$\begin{aligned} A &= P \left(1 + \frac{r}{n} \right)^{12t} \\ &= 15,000 \left(1 + \frac{0.048}{12} \right)^{12t} \\ &= 15,000(1.004)^{12t} \end{aligned}$$

$$\begin{aligned} A &= 15,000(1.004)^{12(2)} \\ &= 15,000(1.004)^{24} \\ &\approx 16,508.22 \end{aligned}$$

The balance after 2 years is \$16,508.22.

Write a compound interest function to model each situation. Then find the balance after the given number of years.

**\$1200 invested at a rate of 3.5%
compounded quarterly; 4 years**

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$= 1,200 \left(1 + \frac{0.035}{4} \right)^{4t}$$

$$= 1,200(1.00875)^{4t}$$

$$A = 1200(1.00875)^{4(4)}$$

$$= 1200(1.00875)^{16}$$

$$\approx 1379.49$$

Write a compound interest function to model each situation. Then find the balance after the given number of years.

**\$4000 invested at a rate of 3%
compounded monthly; 8 years**

$$\begin{aligned} A &= P \left(1 + \frac{r}{n} \right)^{nt} \\ &= 4,000 \left(1 + \frac{0.03}{12} \right)^{12t} \\ &= 4,000(1.0025)^{12t} \end{aligned}$$

$$\begin{aligned} A &= 4,000(1.0025)^{12(8)} \\ &= 4,000(1.0025)^{96} \\ &\approx 5083.47 \end{aligned}$$

The balance after 8 years is \$5,083.47.

- Matthew wants to put \$20,000 in the bank to gain interest for twelve years. He can't decide which bank to put his money in.
- One bank gives simple interest compounded annually at a rate of 8%.
- Another bank gives compound interest compounded annually at a rate of 8%.
- Write a few sentences convincing Matthew which bank he should choose.

Compound Interest



Kiptyn has \$5000 on his credit card statement that he has not paid off. His credit card company charges 15% interest compounded monthly.

- Write an equation to model this situation.

$$K(t) = 5000(1.0125)^{12t}$$

- How much will he owe in three years? **\$7819.72**

- How much more is this than the amount he would have paid if he had not procrastinated his payment? **\$2819.72**

Compare and Contrast

- ❑ Daniel wants to put \$1,000,000 in the bank to gain interest for five years. He can't decide which bank to put his money in.
 - ❑ **Who Wants to be a Millionaire? Bank gives 16% interest compounded annually.**
 - ❑ **Ke\$ha Bank gives 16% interest compounded quarterly.**
 - ❑ **Piggy Bank gives 16% interest compounded monthly.**
1. Before you calculate anything, which bank do you think Daniel should put his money in?
 2. Write an equation for each bank.
 3. How much will Daniel have in each bank account after five years?

Homework

- ▣ Worksheet