

# Interest

Interest is money charged for using other people's money.

## Calculating Simple Interest

Money borrowed, loaned, or invested is called the principal amount, or simply principal.

The interest rate is the percent used in computing the interest (usually per year).

Simple interest is interest computed only on the original principal.

simple interest = principal • rate • time or  $I = P \cdot R \cdot T$

where the rate is understood to be per year and time is in years.

## Calculating Compound Interest

Compound interest is computed on not only the principal, but also on the interest already earned in previous compounding periods.

If interest is compounded annually on an investment, this means that interest is added to the principal at the end of each year and next year's interest is computed on this new amount.

Finding Total Amounts with Compound Interest

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

where A is the total amount, P is the principle, r is the rate, n is the number of times a year it is compounded, t is time in years.

Maggie has a bank account with a principal = \$1500, and her bank compounds the interest 3 times a year at an interest rate of 4%, how much money will she have at the end of the year?

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

$$A = 1500 \left( 1 + \frac{.04}{3} \right)^{3(1)}$$

$$A = 1500 (1 + .0133)^{3(1)}$$

$$A = 1500 (1.0133)^3$$

$$A = 1500 (1.04)$$

$$A = 1560.80 \dots$$

$$\underline{\$ 1560.80}$$

$$S = Prt$$

$$S = 1500 (.04)(1)$$

$$S = 60$$

600

in 10 yrs

~~2220.36~~

151.85

~~2200~~

2220.36

→ → 7220.36

amount

10 yrs

If Bridgit has a bank account with \$23,000 and her bank compounds the interest quarterly at an interest rate of 7%, how much money will she have at the end of the year? (assume that you do not add or withdraw any money from the account)

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

$$A = 23000 \left( 1 + \frac{.07}{4} \right)^{4(1)}$$
$$A = 23000 (1 + .0175)^4$$
$$A = 23000 (1.0175)^4$$
$$A = 23000 (1.071859...)$$
$$A = 24,652.75772$$
$$\$ 24,652.76$$

Eric got a credit card, which charges 11.43% interest to its customers and compounds that interest monthly. Within one day of getting his credit card, he maxes out the credit limit by spending \$1,100.00. If he does not buy anything else on the card and does not make any payments, how much money would he owe the company after 7 months? (assume that they do not charge extra fees each month)

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

$$A = 1100 \left( 1 + \frac{.1143}{12} \right)^{7 \cdot (12)}$$

$$A = 1100 (1.009525)^7$$

$$A = 1100 (1.06861072)$$

$$A = 1175.47$$

$$\$1175.47$$