Simple Interest:

$$I = Prt$$

***I* is the interest earned in dollars.**

***P* is the amount of money loaned or borrowed, called the principal or present value**

***r* is the annual interest rate as a decimal.**

***t* is the amount of time in years.**

Examples:

1. You borrow $580 at 4.3% for 2 years. How much interest will you owe?

2. You deposit $1250 into an account paying 2.3% for 6 months. How much interest will you earn?

If you add the amount of money loaned or borrowed to the amount of interest earned, you get the total amount or future value, *A*.

$$A = P + I = P + Prt$$
$$= P(1 + rt)$$

Examples:

1. You borrow $650 at 4.3% for 90 days. How much will you owe?

2. You deposit $930 into an account paying 2.3% for 48 weeks. How much money will be in the account?

More examples:

1 What simple annual interest rate, rounded to the nearest tenth of a percent will turn $500 into $650.50 in 2 years?

$$A = P(1+rt) \Rightarrow \frac{A}{P} = 1+rt \Rightarrow \boxed{r = \frac{\frac{A}{P}-1}{t}}$$

2. How many years, rounded to the nearest tenth of a year, will it take for $200 to turn into $250 at an annual rate of 4.7%?

$$A = P(1+rt) \Rightarrow \frac{A}{P} = 1+rt \Rightarrow \boxed{t = \frac{\frac{A}{P}-1}{r}}$$

Present Value with Simple Interest:

If you solve the total amount/future value equation for *P*, you get the present value formula for simple interest.

$$A = P(1+rt) \Rightarrow P = \frac{A}{1+rt}$$

Example:

You would like to have $500 2 years from now by depositing money into an account paying 3.1%. How much should you deposit now?

Compound Interest:

In compound interest, interest earns interest. There are time periods called compounding periods, and an interest rate per compounding period called *i*.

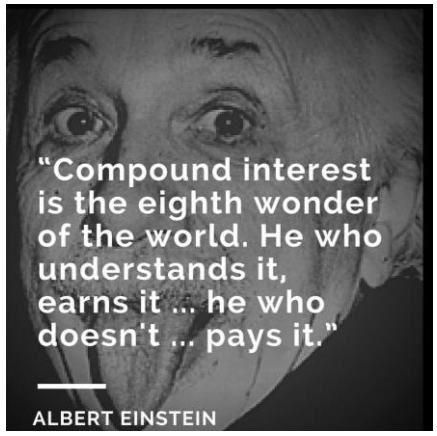
P	**First compounding period**	$P+iP=P(1+i)$	**Second compounding period**	$P(1+i)^2$	**Third compounding period**	$P(1+i)^3$	$\ldots$

So if the process is allowed to continue for *n* compounding periods, then the total amount or future value will be

$$A=P(1+i)^n.$$

In most problems, you will be given the value of *r*, called the annual nominal rate, and the number of compounding periods per year, *m*. To get the value of *i*, simply divide *r* by *m*: $i=\frac{r}{m}$**.**

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



Examples:

1. **You borrow $650 at 2.5% compounded monthly for 2 years. How much will you owe? How much of what you owe is interest?**

2. **You deposit $900 into an account paying 3.1% compounded semi-annually for 4 years. How much money will be in the account? How much of the money in the account is interest?**

3. **You deposit $500 into an account paying 2.1% compounded quarterly for 6 years. How much money will be in the account? How much of the money in the account is interest?**

Present Value with Compound Interest:

If you solve the total amount/future value equation for *P*, you get the present value formula for compound interest.

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

Example:

You would like to have $500 2 years from now by depositing money into an account paying 3.1% compounded weekly. How much should you deposit now?

Comparing Compound Interest Investments:

To compare different compound interest investment schemes, you can find the simple interest rate that generates the same amount of money as the compound scheme in 1 year. This rate is called the Effective Rate.

$$P\left(1+\frac{r}{m}\right)^{m} = P\left(1+r_e\right)$$

$$\left(1+\frac{r}{m}\right)^{m} = \left(1+r_e\right)$$

$$r_e = \left(1+\frac{r}{m}\right)^{m} - 1$$

The larger the effective rate, the more money that will be produced by the compound investment.

Example:

Find the effective rate of 3.1% compounded quarterly.