Simple Interest

P = principal

r = annual interest rate

t = time in years

A = Future Value

5 per 100

$= \frac{5}{100} = .05$

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

\$500 for 1 year @ 5% apr.

$A = 500(1+(.05)(1)) = 500(1.05) = 525$

... for 7 years:

$500(1+.05(7)) = 500(1.35) = \$675.00$

Compound Interest

m = # of periods of compounding per year.

m = 12 (monthly is very common)

m = 52 (weekly)

m = 365 (daily) (360 is common)

m = 12

one month's worth of annual interest rate?

$\left(\frac{12\%}{1\,yr}\right)\left(\frac{1\,yr}{12\,mo}\right) = \frac{1\%}{mo.}$

$= \frac{r}{m}$

0 P

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

2 $P\left(1+\frac{r}{m}\right) + P\left(1+\frac{r}{m}\right)\frac{r}{m}$

$= P\left(1+\frac{r}{m}\right)\left[1+\frac{r}{m}\right]$

$P\left(1+\frac{r}{m}\right)^2$

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

$= \frac{r}{m}$

3 $P\left(1+\frac{r}{m}\right)^3$

⋮

371 $P\left(1+\frac{r}{m}\right)^{371}$

371 is in months (periods)

Usually given time, in years.

$i = \frac{r}{m}$ = rate per period

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

$n = mt$ = total # of periods.

Present value

Somebody promises you $500 in 2 years

$A = P(1+\frac{r}{m})^{mt}$

$r = 7\%$

$m = 12$

$t = 2$

$500 = P(1+\frac{.07}{12})^{12 \cdot 2}$

P is the present value

Solve for P

$\frac{500}{(1+\frac{.07}{12})^{24}} = P$

$P = A(1+\frac{r}{m})^{-mt}$