Compound Interest

Good or Bad?
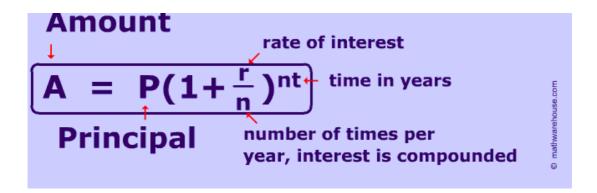
<u>Compound Interest</u>

Last year, we studied compound interest. Remember: $A = P(1+r)^t$ or

$A = P\left(1+\dfrac{r}{n}\right)^{nt}$ where P is the amount you invest, r is the rate (as a percent), t is the

time, n is the number of compounds and A is the amount you have at the end. We
also studied $A = Pe^{rt}$, which is the formula we use for compounding continuously.

<u>**Using the Financial Application**</u>

1.   Open the Application:

      Apps: Finance: Enter (tvm solver): Enter

2.   Understand the variables:

      N = the number of compounds
      I% = <u>annual</u> interest rate (as a percent)
      PV = the present value of the loan or investment
      FV = future value of the loan or investment
      P/Y = payments per year
      C/Y = compounds per year (automatically fills in same as P/Y)

3.   To perform a calculation:

      - Move the cursor to the variable you want to calculate, then:
        - Alpha: Enter (Solve)
      - The value will automatically calculate
      - PV and FV will be opposite signs. Also PMT will be negative on loans

Compound Interest:

1. How much money will you have if you invest $5,000 at 5% interest for 10 years compounded quarterly?

   PV   I

   P/y = 4   N = 10 × 4

   $8218.10

   NORMAL FLOAT AUTO REAL RADIAN MP
   ```
   N=40
   I%=5
   PV=5000
   PMT=0
   ▪FV=-8218.097317
   P/Y=4
   C/Y=4
   PMT:END BEGIN
   ```

2. How much money will you have if you invest $400 at 8% interest for 6 years compounded monthly?

   PV   I

   P/y=12   n=6×12

   $645.40

   NORMAL FLOAT AUTO REAL RADIAN MP
   ```
   N=72
   I%=8
   PV=400
   PMT=0
   ▪FV=-645.4008669
   P/Y=12
   C/Y=12
   PMT:END BEGIN
   ```

3. How much money will you have to invest today in order to have $1,000,000 in 30 years, compounded monthly at a 4% interest?

   PV=?   FV

   n=30×12   P/y=12   I

   NORMAL FLOAT AUTO REAL RADIAN MP
   ```
   N=360
   I%=4
   ▪PV=-301795.8652
   PMT=0
   FV=1000000
   P/Y=12
   C/Y=12
   PMT:END BEGIN
   ```

   301,795.87

4. If you start with $100,000 today, how long until you have $1,000,000 if
    invested at 5% compounded quarterly?

$$PV \qquad N \qquad FV$$

$$I$$

$$P/y = 4 \qquad 185.4 \text{ quarters}$$

$$185.4/4 = 46.35 \text{ yrs}$$

5. Re-calculate #1 if compounded continuously.

    1. How much money will you have if you invest $5,000 at 5% interest for 10
        years compounded quarterly?

6. Re-calculate #2 if compounded continuously.
    2. How much money will you have if you invest $400 at 8% interest for 6 years
        compounded monthly?

Use the Finance App to Calculate Monthly Payments

a) You found a nice car at a dealership for $15,000 plus tax and $125 DMV fees. You intend to make a $1,000 down payment. How much will you need a loan for?

car   15,000

tax   15,000 (.08) = 1200

DMV   125

16,325 − 1,000 = 15,325

DP

b) What will be you monthly payments if you finance at 7.8% for 5 years? How much interest will you pay in 5 years?

```
NORMAL FLOAT AUTO REAL RADIAN MP

 N=60
 I%=7.8
 PV=15325
▪PMT=-309.2709562
 FV=0
 P/Y=12
 C/Y=12
 PMT:END BEGIN
```

$309.27

c) The dealership is running a 0% interest deal. Recalculate your monthly
payments.

```
NORMAL FLOAT AUTO REAL RADIAN MP
  N=60
  I%=0
  PV=15325
 ▪PMT=-255.4166667
  FV=0
  P/Y=12
  C/Y=12
  PMT:END BEGIN
```

255.42

d) You can only afford $300/month. What is the maximum interest rate you
can afford?

Cars

Buying a Car

When buying a car, some people look at new cars as well as used cars. What information is needed before deciding which to buy?

New Car Purchases

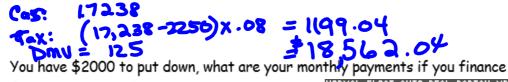What is the "Sticker Price"? *What the manufacturer suggests they sell for.*

Is this the price you will pay for the car? *No!*

What is the "Trade-In Allowance" and how does it affect the amount you pay for your new car?

When you buy your first car, someone (probably your parents) will have to co-sign for you. What does this mean?

Vehicle Cost = Negotiated Price – Trade-In Allowance + Sales Tax + Registration Fees

1.   You negotiated a price of $17,238 for the car with all of the options you wanted. You get a trade-in allowance of $2,250 for your old car. You pay 8% sales tax and a registration fee of $125. What do you owe the dealer?

Cost: 17238
Tax: (17,238 -2250)x.08 = 1199.04
DMV = 125 $18,562.04

You have $2000 to put down, what are your monthly payments if you finance for 5 years at 5.5% interest?

Borrow   16,562.04

What is the total amount paid for the vehicle?

```
NORMAL FLOAT AUTO REAL RADIAN MP

 N=60
 I%=5.5
 PV=16562.04
▪PMT=▮316.3542119
 FV=0
 P/Y=12
 C/Y=12
 PMT:END  BEGIN
```

What is the total interest you would pay?