A TVM Calculator (Time Value of Money) can compute compound interest.

TVM Calculator

Financial (fn)Calulators

PV is present value
PMT is payment
FV is future value
Rate is interest rate
Periods is number of compounding periods
Dropdown box is Annual, Monthly, etc.
Button to compute unknown value.

Remember that money-in-your-pocket (to receive a loan) is positive and money-out-of-your-pocket (to make an investment) is negative. This rule applies to PV and PMT. Fill-in the known values and push the button to compute the unknown value (highlighted in gray).

The Rule of 72 says how long it will take for an investment to double at a given interest rate. e.g. if you get 7% in the "S&P 500 Index" mutual fund, it will take 10 years before $1000 will equal $2000. It would take 10 doubles to earn $1M. That's 100 years. It only takes 50 years if you start with $32K and 25 years if you add $1K per month!

72 / 7% ≈ 10 yrs for one double. 9 years at 8%.

```
 TVM Calculator
   PV: -32000          Rate: 7
  PMT: -1000         Periods: 300.99
   FV: 1000000        Monthly
  PV    PMT     FV    Rate Periods
```

Mutual funds are made up of **Stocks**, ownership interest in a company and **Bonds**, loans to a company paid back on a schedule.

Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling.

Inflation has been about 3.5% for the past 50 years so the rule of 72 says that the value of a dollar will drop by half in 20 years.

72 / 3.5% ≈ 20 yrs

This means if you could retire now comfortably with $1M, in 20 years you will need $2M.

```
 TVM Calculator
   PV: -1000000       Rate: 3.53
  PMT: 0           Periods: 20
   FV: 2000000       Annual
  PV   PMT   FV   Rate Periods
```

If you owe $300K on a 30 year mortgage after a down payment of 20% at an interest rate of 4%, your monthly payment would be $1432.25.

```
 TVM Calculator
   PV: 300000         Rate: 4
  PMT: -1432.25    Periods: 360
   FV: 0           Monthly
  PV   PMT   FV   Rate Periods
```

A 15 year loan payment would be $2219.06.

```
 TVM Calculator
   PV: 300000         Rate: 4
  PMT: -2219.06    Periods: 180
   FV: 0           Monthly
  PV   PMT   FV   Rate Periods
```

```
1432 x 360 = 515520
2219 x 180 = 399420
             ------
             116100
```

The difference out-of-pocket to you is $116100.

Indeed.com shows national salaries average about $100K for an application developer and $125K for an architect. These are averages so your goal should be $150K per year. As a note, that is $71 per hour or about $24 per hour for every $50K per year.
Then figure:

$50K for taxes
$50K for living expense ($4K per month after taxes)
$50K for investments ($4K per month in investments)

It would take 20 years to have $2M in investments if you got 7% return on $4K per month or 18 years at 8% in something like Vanguard Target Retirement 2035 Fund (VTTHX).

```
TVM Calculator
   PV: 0              Rate: 7
  PMT: -4000       Periods: 234.72
   FV: 2000000     Monthly
  PV   PMT    FV   Rate Periods
```

```
TVM Calculator
   PV: 0              Rate: 8
  PMT: -4000       Periods: 220.68   What is FV at ±24 months?
   FV: 2000000     Monthly
  PV   PMT    FV   Rate Periods
```

If you only make $100K per year, it would take 22 years to have $2M at 7% and $3.3K per month.

```
TVM Calculator
   PV: 0              Rate: 7
  PMT: -3300       Periods: 259.94
   FV: 2000000     Monthly
  PV   PMT    FV   Rate Periods
```

```
TVM Calculator
   PV: 0              Rate: 8
  PMT: -3300       Periods: 243.43
   FV: 2000000     Monthly
  PV   PMT    FV   Rate Periods
```

The one thing you have control over when investing in mutual funds is the fees you pay. Actively managed fund are about 2% more per year than passive index funds. If you invest $100,000 in a index fund and you get 7% after fees, then over your lifetime (50 years invested, from 25 to 75) you get $3.3M.

```
TVM Calculator
   PV: -100000        Rate: 7
  PMT: 0           Periods: 600
   FV: 3278041     Monthly
  PV   PMT   FV    Rate Periods
```

In an actively managed fund with 5% return after fees, you would get $1.2M. You just gave up 2/3 of you investment return to fees!

```
TVM Calculator
   PV: -100000        Rate: 5
  PMT: 0           Periods: 600
   FV: 1211938     Monthly
  PV   PMT   FV    Rate Periods
```

Most people spend what they earn, try to be the one that invests what they earn!

Back in about 2000, Scott Burns did a study called the Trinity Study that says the safe withdrawal rate of your retirement account is 4%. This is how much you can safely withdraw from your account with a 98% chance of not running out of money in your old age using an asset allocation of 75% stocks and 25% bonds. 4% of $2M is $80K per year or $6.7K per month. That's $3.3K per month in today's dollars plus your home is paid off if you did a 15 year mortgage. This factors in a cost-of-living adjustment (COLA) based on a 3% inflation and 7% return on your investment.

You should never have debt except for a home. Here is an example of a credit card debt. Say you have $6000 debt on a credit card at 20%.

You have to pay at least $100 per month on that just so the balance doesn't go up! This is like giving the credit card company an immediate annuity. A never-ending stream of $100 bills. If you buy an immediate annuity, you would be lucky to get 6%.

```
TVM Calculator
  PV: 6000           Rate: 20
 PMT: -100        Periods: 600    20/30/50 years!
  FV: 6000        Monthly
 PV   PMT   FV   Rate Periods
```

If you take 20 years to pay it off, you will pay $101.93 x 240 months = $24,500 on a $6000 debt. If you paid $200 per month instead, it would take 42 months or $8,400. That's a $16,000 difference in cost to payoff the debt.

```
TVM Calculator
  PV: 6000           Rate: 20
 PMT: -101.93     Periods: 240
  FV: 0           Monthly
 PV   PMT   FV   Rate Periods
```

```
TVM Calculator
  PV: 6000           Rate: 20
 PMT: -200        Periods: 41.93
  FV: 0           Monthly
 PV   PMT   FV   Rate Periods
```

If you get 7% in an S&P500 mutual fund. How much do you have to contribute each month to accumulate $1M dollars:

a) In 20 years.

```
 TVM Calculator
   PV: 0               Rate: 7
  PMT: -1919.66     Periods: 240
   FV: 1000000      Monthly
  PV    PMT    FV    Rate Periods
```

You have to contribute $461k over 20 years to earn $1M.
In other words, you have to put in 46% of it out of your own pocket.

b) in 40 years.

```
 TVM Calculator
   PV: 0               Rate: 7
  PMT: -380.98      Periods: 480
   FV: 1000000      Monthly
  PV    PMT    FV    Rate Periods
```

You have to contribute $183k over 40 years to earn $1M.
In other words, you have to put in 18% of it out of your own pocket.