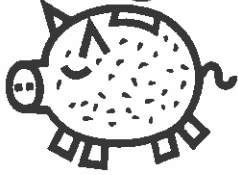


Name

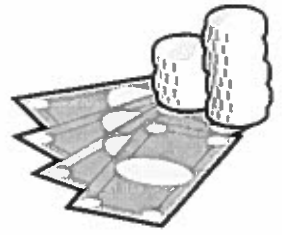
Key

Hour



Saving and Borrowing

An application of exponential functions



1. You want to start saving for college and decide to put all your summer earnings in a savings account. If you earn \$1200 each summer for the next three summers and earn 6.5% interest compounded ^{annually} monthly, how much will you have before starting college?

$$\begin{array}{l} \text{1st year} \\ \$1200 \end{array} \quad \begin{array}{l} \text{2nd year} \\ 1200(1.065) + 1200 \end{array} \quad \begin{array}{l} \text{3rd year} \\ 1200(1.065)^2 + 1200(1.065) + 1200 \end{array} = \boxed{\$3839.07}$$

Using the Finance Function on the TI-83 graphing calculator

TVM = Time Value of Money
Let's try #1 using the graphing calculator:

N = # total payments
I% = annual interest rate
PV = Present value
PMT = payment amt
FV = future value
P/Y = payments per year
C/Y = compounding per year
PMT: END BEGIN
whether you make pmt at beg. or end of month

Fill in the values:

N = 3
I% = 6.5 (don't change to decimal)
PV = 0
PMT = -1200 (cash output)
FV = ? what we are looking for
P/Y = 1
C/Y = 1
PMT: END BEGIN

The value we are solving for will be left blank. Hit the "ALPHA" (green) key and "ENTER" to solve.

\$3839.07

How much to make a million?

2. Assume an interest rate of 8% compounded monthly. How much would you have to save each month in order to have one million dollars by the time you are:

a. 30 years old

N = ← How many months until you are 30?
I% = 9
PV = 0
PMT = ?
FV = 1,000,000
P/Y = 12
C/Y = 12
PMT: End

b. 50 years old

N =
I% = 9
PV = 0
PMT = ?
FV = 1,000,000
P/Y = 12
C/Y = 12
PMT: End

c. 65 years old

N =
I% = 9
PV = 0
PMT = ?
FV = 1,000,000
P/Y = 12
C/Y = 12
PMT: End

Freshmen - $N \approx 180$
Soph - $N \approx 168$
Juniors - $N \approx 156$
Seniors - $N \approx 144$

$N \approx 420$
 $N \approx 408$
 $N \approx 396$
 $N \approx 384$

$N \approx 600$
 $N \approx 588$
 $N \approx 576$
 $N \approx 564$

When people buy a house, they usually take out a loan called a *mortgage*.

3. How much would an individual pay back after 30 years if they borrowed \$300,000 at 6% interest compounded monthly? (Find monthly payment first)

$$\begin{aligned} N &= 12 \cdot 30 = 360 \\ I\% &= 6 \\ PV &= 300,000 \\ PMT &= ? \\ FV &= 0 \\ P/Y &= 12 \\ C/Y &= 12 \\ PMT &: \text{End} \end{aligned}$$

$$\begin{aligned} &\$ 1798.65 \text{ per month} \\ &\times 360 \text{ months} \end{aligned}$$

$$\begin{aligned} &\boxed{\$ 647,514} - 300,000 = \\ &\quad \underline{\$ 347,514 \text{ in interest}} \end{aligned}$$

4. How much money would they pay back (with same interest rate) over the course of 15 years?

$$\begin{aligned} N &= 12 \cdot 15 = 180 \\ I\% &= 6 \\ PV &= 300,000 \\ PMT &= ? \\ FV &= 0 \\ P/Y &= 12 \\ C/Y &= 12 \\ PMT &: \text{End} \end{aligned}$$

$$\begin{aligned} &\$ 2531.57 \text{ per month} \\ &\times 180 \text{ months} \end{aligned}$$

$$\begin{aligned} &\boxed{\$ 455,682.60} \\ &\quad - 300,000 \\ &\quad \underline{\$ 155,682.60 \text{ interest}} \end{aligned}$$

Savings of
\$ 191,651.40

Credit cards

Credit cards are convenient, but if you don't pay off your balance each month, you are often charged high rates of interest.

5. You go on a spending spree and put \$1000 on a credit card. The card charges 18% interest which is compounded monthly. You make the minimum payment of \$20 each month.

$$\begin{aligned} N &= ? \\ I\% &= 18 \\ PV &= 1000 \\ PMT &= -20 \\ FV &= 0 \\ P/Y &= 12 \\ C/Y &= 12 \\ PMT &: \text{End} \end{aligned}$$

- a. How many payments will you make before you pay off the balance?

$$93.11$$

- b. How long will it take you to pay off your balance?

$$7.75 \text{ years}$$

- c. How much money do you end up paying back?

$$93.11 \times 20 = \boxed{\$ 1862.20}$$

(\$ 862.20 in interest)

6. Britany puts \$2000 worth of purchases on her credit card. Her card charges 19% interest compounded monthly. She can afford to make a monthly payment of \$35.

- a. How many payments will Britany make to pay off her balance?

$$149.68$$

- b. How much money does she end up paying back?

$$149.68 \times 35 = \boxed{\$ 5238.80}$$

- c. If Britany can only afford a \$25 monthly payment how long will it take?

$$\text{change PMT to } -25$$

$$\begin{aligned} N &= ? \\ I\% &= 19 \\ PV &= 2000 \\ PMT &= -35 \\ FV &= 0 \\ P/Y &= 12 \\ C/Y &= 12 \\ PMT &: \text{End} \end{aligned}$$

"Error" - She will never pay this off!
Interest accumulates faster than what she is paying