Worksheet Solutions...

Worksheet - Introduction to Compound Interest.doc

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8.5 Investments Involving Regular Payments

GOAL

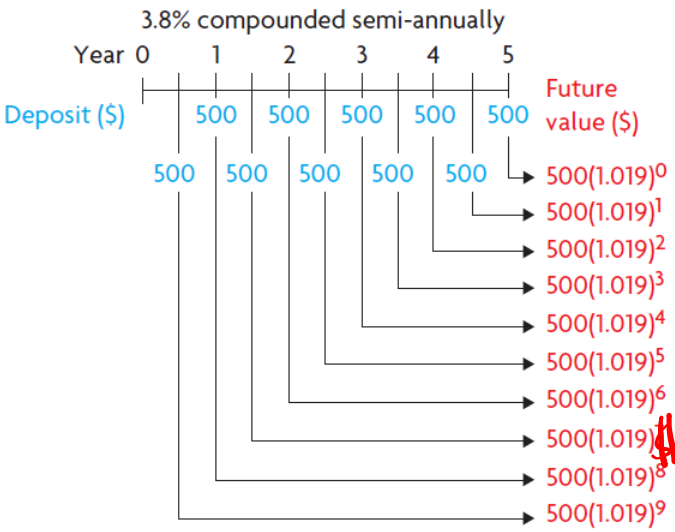
Determine the future value of an investment that earns compound interest involving regular payments.

EXAMPLE 1 p. 485 — Determining the future value of an investment involving regular deposits

Darva is saving for a trip to Australia in 5 years. She plans to work on a student visa while she is there, so she needs only enough money for a return flight and her expenses until she finds a job. She deposits $500 into her savings account at the end of each 6-month period from what she earns as a server. The account earns 3.8%, compounded semi-annually. How much money will be in the account at the end of 5 years? How much of this money will be earned interest?

SOLUTION BY HAND...

I drew a timeline to show the future value of each of the $500 deposits that I made at the end of each 6-month period for 5 years.

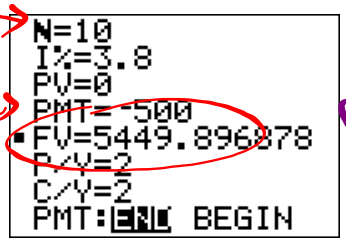


P => PMT x N

I could see that I needed to do 10 calculations and then determine the sum.

Pmt out $500

PMT x N



I = 5449.90 - 5000

= $449.90

Notes - TVM Solver.pdf

INSTRUCTIONS on using the TVM-Solver...

1.) On the TI-83, press 2nd, then FINANCE, then select 1:TVM Solver. On the TI-83 plus and TI-84, press APPS, then 1:FINANCE, then 1:TVM Solver. You should see the screen below:

```
N=
I%=0
PV=0
PMT=0
FV=0
P/Y=1
C/Y=1
PMT:END BEGIN
```

2.) Now, suppose you are taking out a 5-year loan on $25000 at 6% annual interest compounded monthly and you want to know the monthly payment. Fill in the values on the TVM Solver screen as shown:

```
N=60
I%=6
PV=25000
PMT=
FV=0
P/Y=12
C/Y=12
PMT:END BEGIN
```

3.) Now, move the cursor to PMT, press the green ALPHA key, then ENTER. Your payment will show up as a negative number:

```
N=60
I%=6
PV=25000
▪PMT=-483.32003…
FV=0
P/Y=12
C/Y=12
PMT:END BEGIN
```

NOTE: a **negative** number means that the money is coming 'out of your pocket'

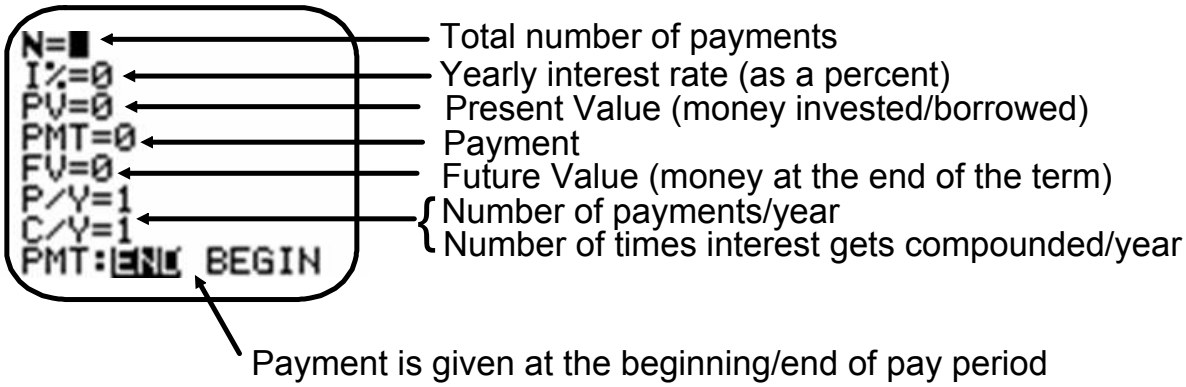
4.) Suppose you know you can afford a $250 per month payment on a 60 month loan at 6% annual interest compounded monthly. Fill out the TVM Solver screen as shown:

```
N=60
I%=6
PV=0
PMT=-250
FV=0
P/Y=12
C/Y=12
PMT:END BEGIN
```

5.) To find how much you can afford to borrow, move the cursor to PV, press the green ALPHA key, then ENTER. The amount you can afford to borrow is shown:

```
N=60
I%=6
▪PV=12931.39019
PMT=-250
FV=0
P/Y=12
C/Y=12
PMT:END BEGIN
```

SOLUTION WITH TI-84 (Finance APP)...



EXAMPLE 2 p. 487

Comparing a regular payment investment with a single payment investment

Adam made a $200 payment at the end of each year into an investment that earned 5%, compounded annually. Blake made a single investment at 5%, compounded annually. At the end of 5 years, their future values were equal.

a) What was their future value? $1105.13
b) What principal amount did Blake invest 5 years ago?
c) Who earned more interest? Why?

Blake

$I = 1105.13 - 865.90$

$\$239.23$

865.90

Adam (APP)

N 5
I 5
PV 0
PMT -200
FV $1105.13
P/Y 1
C/Y 1
END

N=5
I%=5
PV=0
PMT=-200
FV=1105.12625
P/Y=1
C/Y=1
PMT:END BEGIN

Formula

Blake

$A = P(1 + \frac{r}{n})^{nt}$

$1105.13 = P(1 + \frac{0.05}{1})^{5}$

$P = \frac{A}{(1 + \frac{r}{n})^{nt}}$

$= \frac{1105.13}{(1 + \frac{0.05}{1})^{5}}$

$= \$865.90$

EXAMPLE 3 p. 489

Determining the interest rate of a regular payment investment

Jeremiah deposits $750 into an investment account at the end of every 3 months. Interest is compounded quarterly, the term is 3 years, and the future value is $10 059.07. What annual rate of interest does Jeremiah's investment earn?

```
N=12
I%=8.000019121
PV=0
PMT=-750
FV=10059.07
P/Y=4
C/Y=4
PMT:END BEGIN
```

$r = 8\%/\text{yr}$

EXAMPLE 4 p. 490 — Determining the regular payment amount of an investment

Celia wants to have $300 000 in 20 years so that she can retire. Celia has found a trust account that earns a fixed rate of 10.8%, compounded annually.

a) What regular payments must Celia make at the end of each year to meet her goal of $300 000?

b) How much interest will she earn over the 20 years?

APP

a) N = 20
I = 10.8
PV = 0
* PMT = −4781.09
FV = 300 000
P/Y = 1
C/Y = 1
END

Yearly Payment

$4781.09

EXAMPLE 5 p. 491

Determining the term of a regular payment investment

On Luis's 20th birthday, he started making regular $1000 payments into an investment account at the end of every 6 months. He wants to save for a down payment on a home. His investment earns 3.5%, compounded semi-annually. At what age will he have more than $18 000?

```
▪N=15.78433191
 I%=3.5
 PV=0
 PMT=-1000
 FV=18000
 P/Y=2
 C/Y=2
 PMT:END BEGIN
```

16 payments * twice a year

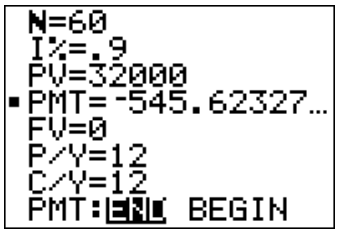
$\frac{16}{2} = 8$ years

28 yrs old

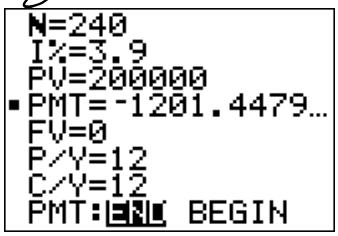
New Car → $32 000 (taxs in fees paid)

r ⇒ 0.9%

t = 5 years



House → 3.9% over 20 years
$200 000

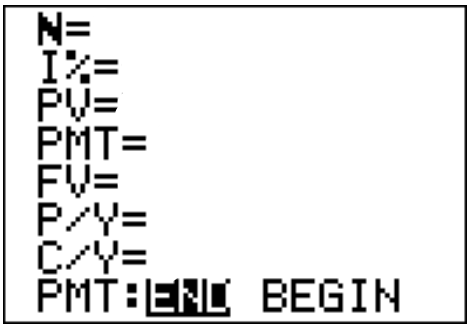


HOMEWORK...

p. 493: #3, 5, 6, & 9

NOTE: When using the TI-84...

Each question must have the following completed for homework AND beginning of class tomorrow you will be given time to solve.



Attachments

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