

Practice With Compound Interest...

Worksheet - Introduction to Compound Interest.doc

Worksheet Solutions - Compound Interest.pdf

Work A I

\$12 000	8%	15 a	Simple Interest		26400	14400
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$P + I$ Prt

$12000 + 14400$ $12000(0.08)(15)$
 $= 14400$

7. a) How much should Desiree invest at 6%, compounded monthly, to have \$10 000 in 3 years?
 b) How much should Desiree invest if the compounding period is semi-annual?

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

$$= \frac{10000}{(1 + \frac{0.06}{12})^{36}}$$

$$= 8356.449188$$

$$= \$8356.45$$

b)

$10000 / (1 + 0.06 / 12)^{36}$	8356.449188
$10000 / (1 + 0.06 / 2)^6$	8374.842567

10. An investment of \$250 grew to \$1000 at 6% interest, compounded semi-annually. Estimate how long it took for the investment to grow, and then verify your estimate.

$$t = ?$$

$$250 \xrightarrow[12 \text{ yrs}]{\times 2} 500 \xrightarrow[12 \text{ yrs}]{\times 2} 1000$$

Rule of 72

$$\text{Double} = \frac{72}{6}$$

$$= 12 \text{ years}$$

$$\text{TOTAL} \Rightarrow 12 \times 2 = 24 \text{ years}$$

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

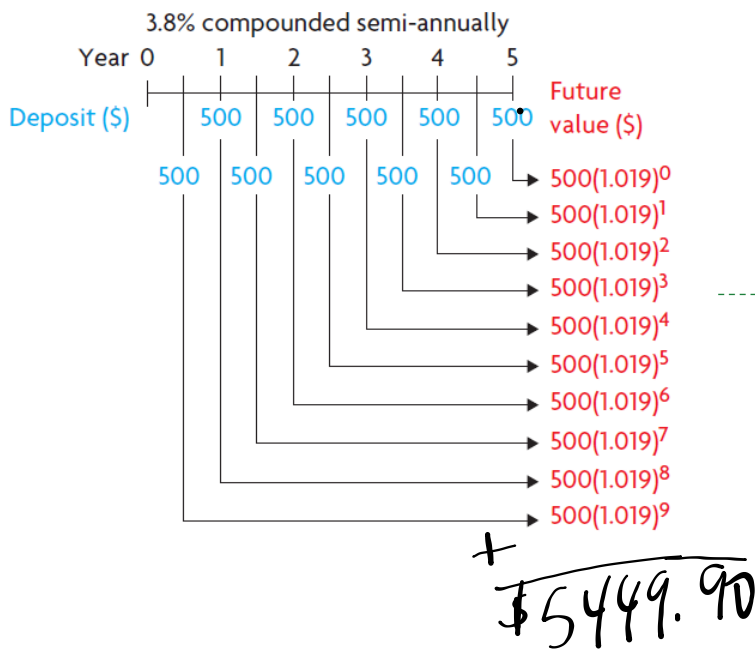
Darva is saving for a trip to Australia in 5 years. She plans to work on a student visa while she is there, so she needs only enough money for a return flight and her expenses until she finds a job. She deposits \$500 into her savings account at the end of each 6-month period from what she earns as a 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.

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



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

```

N=10
I% = 3.8
PV=0
PMT = -500
FV = 5449.896878
P/Y = 2
C/Y = 2
PMT: END BEGIN
    
```

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: [2ND] [ENTER] 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: [2ND] [ENTER] 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: [2ND] [ENTER] BEGIN
```

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

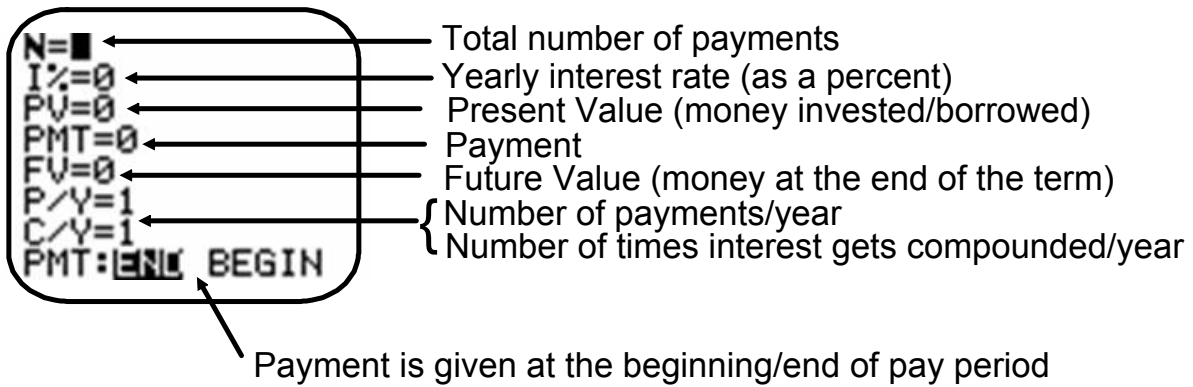
4.) Suppose you know you can afford a \$250 per month payment on a 60 month loan at 6% annual interest compounded monthly. Fill out the TVM Solver screen as shown:

```
N = 60
I% = 6
PV =
PMT = -250
FV = 0
P/Y = 12
C/Y = 12
PMT: [2ND] [ENTER] 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: [2ND] [ENTER] BEGIN
```

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



EXAMPLE 2 p. 487 **APP** 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.

NOTE
 $P = PMT \times N$

- a) What was their future value? **1105.13**
- b) What principal amount did Blake invest 5 years ago? **865.90**
- c) Who earned more interest? Why?

a) Adam (APP)

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

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

Pay out
 $= 5 \times 200$
 $= 1000$

c) $I = 1105.13 - 1000$
 $I = 105.13$

b) Blake (formula)

$A = P \left(1 + \frac{r}{n}\right)^{nt}$
 $P = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}}$
 $= \frac{1105.13}{\left(1 + \frac{0.05}{1}\right)^5}$
 $P = 865.90$

c) $I = 1105.13 - 865.90$
 $I = 239.23$
 More interest

EXAMPLE 3 Determining the interest rate of a regular
 p. 489 payment investment

APR *4 times a year*

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
    
```

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

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?

a)

```

N=20
I%=10.8
PV=0
PMT=-4781.08988
FV=300000
P/Y=1
C/Y=1
PMT: [ ] BEGIN
    
```

b)

APP

$$N \times PMT$$

$$\text{Paid} \Rightarrow 20 \times 4781.09 = 95621.80$$

$$I = 300000 - 95621.80$$

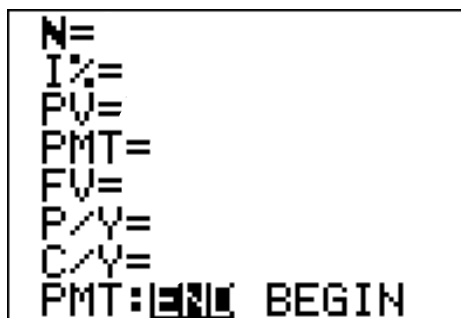
$$I = 204378.20$$

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.



A screenshot of a TI-84 calculator screen showing a list of variables to be set for homework. The variables are listed vertically: N=, I/Y=, PV=, PMT=, FV=, P/Y=, C/Y=, and PMT: [] [] BEGIN. The PMT: field is currently empty, and the word 'BEGIN' is displayed to the right of the field.

Attachments

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Notes - TVM Solver.pdf