

HOMEWORK...

p. 468: **Rule of 72...**

#3 (only estimate the doubling time)

#5a & #8

Compound Interest (Future Value)

#10 & #12

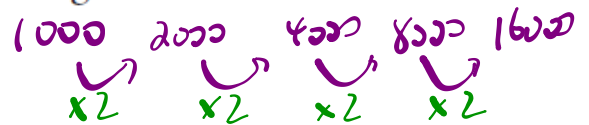
p. 478: **Compound Interest (Present Value)**

#4, #6, #7, & #9

8. Estimate how long it would take for \$1000 to grow to \$16 000 at each interest rate, compounded annually.

a) 6%

b) 12%



Doubling

$$t = \frac{72}{\text{Rate}} \times 4$$

$$= \frac{72}{6} \times 4$$

$$= 12 \times 4$$

$$= 48 \text{ years}$$

10. Solomon bought a \$40 000 corporate bond (an investment in the form of a loan to a company that earns interest). The bond earns 4.8%, compounded semi-annually. After 4 years, the interest rate changed to 6%, compounded annually. Determine the value of Solomon's investment after 6 years.

$$A = 40000 \left(1 + \frac{0.048}{2}\right)^{2 \times 4}$$

$$A = \$48357.03$$

4 years

Reinvest →

$$A = 48357.03 \left(1 + \frac{0.06}{1}\right)^{6-4}$$

$$A = \$54333.96$$

6. Claire wants a down payment of \$17 500 to buy a house in 10 years, when she turns 30. Her bank offers her an investment with 5.6% interest, compounded semi-annually. What present value will she need to invest now?

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

$$P = \frac{17500}{\left(1 + \frac{0.056}{2}\right)^{2 \times 10}}$$

$$P = 10073.39$$

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

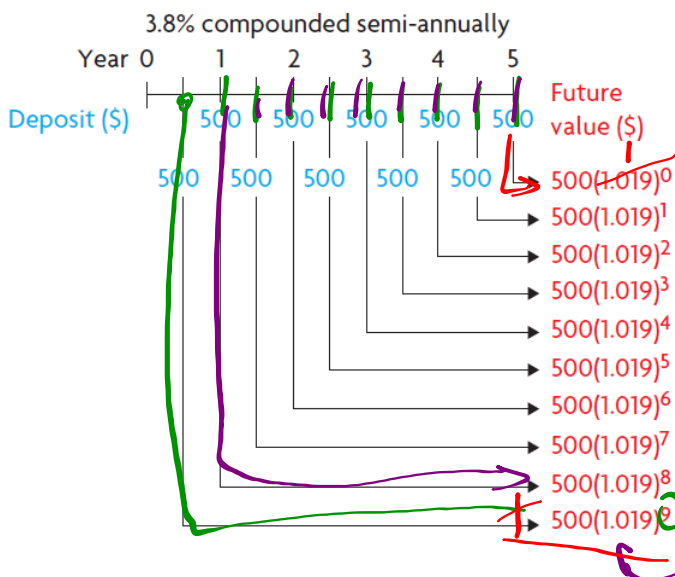
Determining the future value of an investment involving regular deposits

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.



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

$$= 500 \left(1 + \frac{0.038}{2} \right)^9$$

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

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: [ ] 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: [ ] 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: [ ] 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: [ ] 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: [ ] BEGIN
```

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

N= ← Total number of payments
 I%=0 ← Yearly interest rate (as a percent)
 PV=0 ← Present Value (money invested/borrowed)
 PMT=0 ← Payment * negative
 FV=0 ← Future Value (money at the end of the term)
 P/Y=1 ← { Number of payments/year
 C/Y=1 ← { Number of times interest gets compounded/year
 PMT: [] BEGIN

Payment is given at the beginning/end of pay period

$$P = PMT \times N$$

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 WITH TVM-Solver...

$$P = 500 \times 10$$

$$P = 5000$$

$$I = 5449.90 - 5000$$

$$I = 449.90$$

SOLUTION by hand...

$$a) \$5449.90$$

```

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


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.

*APP
↳ payments

*Formula
↳ once

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

\$1105.13

Adam

Blake

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

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

b) $P = \frac{1105.13}{(1+0.05)^5}$
865.8982723

$$P = 200 \times 5$$

$$P = 1000$$

$$I = 1105.13 - 1000$$

$$I = 105.13$$

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

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.

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

Attachments

Notes - TVM Solver.pdf