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

3. For each investment, p. 468
   i) use the Rule of 72 to estimate the doubling time and then determine the doubling time.
   ii) determine the future value and the total interest earned.

	Principal (P) ($)	Rate of Compound Interest per Annum (%)	Compounding Frequency	Term (years)
a)	7 000	6.8	annually	35
b)	850	9.2	monthly	20
c)	12 500	15.6	weekly	5
d)	40 000	2.7	semi-annually	8

a) $\frac{72}{6.8} = 10.6$ years ↑ estimate

Pre Calc 11

$\frac{14000}{7000} = \frac{7000(1+\frac{0.068}{1})^t}{7000}$

$2 = (1+0.068)^t$ ↑ *logarithms

ii) $A = 7000(1+\frac{0.068}{1})^{1\times35}$

a)

7000(1+0.068)^35
69999.00782

$I = 69999.01 - 7000$

$I = \$62999.01$

d) $\frac{72}{2.7} = 26.67$ yrs ↑ Double

$A = 40000(1+\frac{0.027}{2})^{2\times16}$

A = 49572.41078

$I = 49572.41 - 40000$

$I = \$9572.41$

8. Estimate how long it would take for $1000 to grow to $16 000 at each interest rate, compounded annually.
   a) 6% b) 12%

$t = ?$

$1000 \xrightarrow{\times 2} 2000 \xrightarrow{\times 2} 4000 \xrightarrow{\times 2} 8000 \xrightarrow{\times 2} 16000$

$t = \frac{72}{6}$

$t = 12\text{yrs}$

TOTAL $12\text{yrs} \times 4 = 48\text{ years}$

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

$A = 48357.03\left(1 + \frac{0.06}{1}\right)^{1\times 2}$

$A = \$54333.76$

Term (years)	Rate (%)
1	1.35
2	1.65
3	1.90
4	2.15
5	2.65
6	2.70
7	2.85
8	2.90
9	3.00
10	3.25

2. Lenny has $5000 to invest and is looking at different GICs, as shown in the table to the left. These GICs cannot be redeemed until their maturity.

a) Why do you think the interest rates increase as the term increases?

b) Lenny cannot decide whether to invest $5000 for 10 years or to invest $5000 for 5 years and then reinvest for another 5 years.

i) Compare the future values of each option. What assumptions are you making?

ii) What are the advantages and disadvantages of each option?

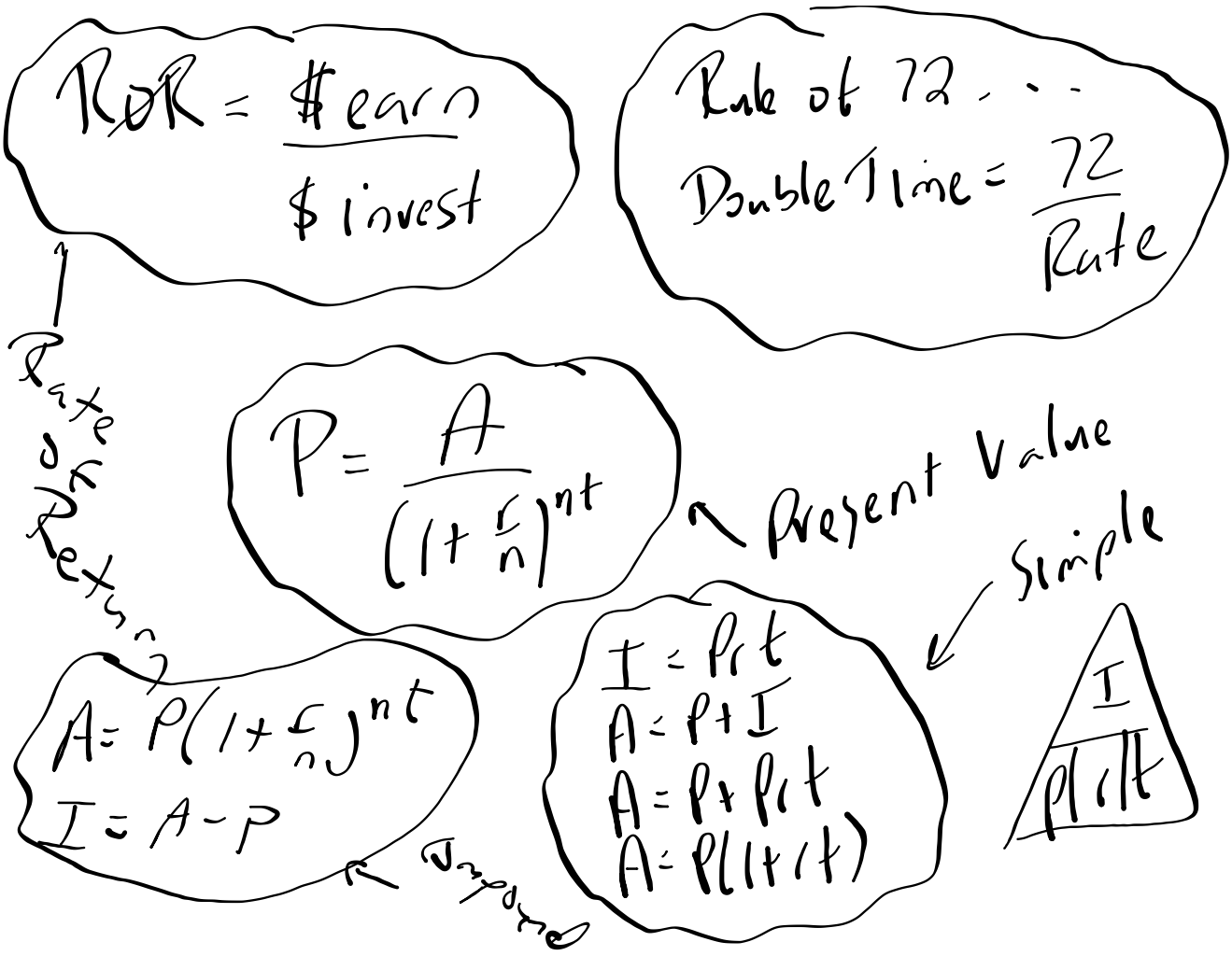
a) Longer the $ is in account → better for them to make $ from loaning it out.

10 yrs

```
5000(1+0.0325/1)
^10
     6884.471519
```

5 yrs then reinvest

```
5000(1+0.0265/1)
^5
     5698.555375
5698.56(1+0.0265
)^5
     6494.711944
```


ROR = $earn / $invest
Rule of 72...
Double Time = 72 / Rate
Rate or Return
$P = \frac{A}{(1+\frac{r}{n})^{nt}}$
Present Value
Simple
$A = P(1+\frac{r}{n})^{nt}$
$I = A - P$
Compound
$I = Prt$
$A = P + I$
$A = P + Prt$
$A = P(1+rt)$
I
Prt

8.5 Investments Involving Regular Payments

GOAL

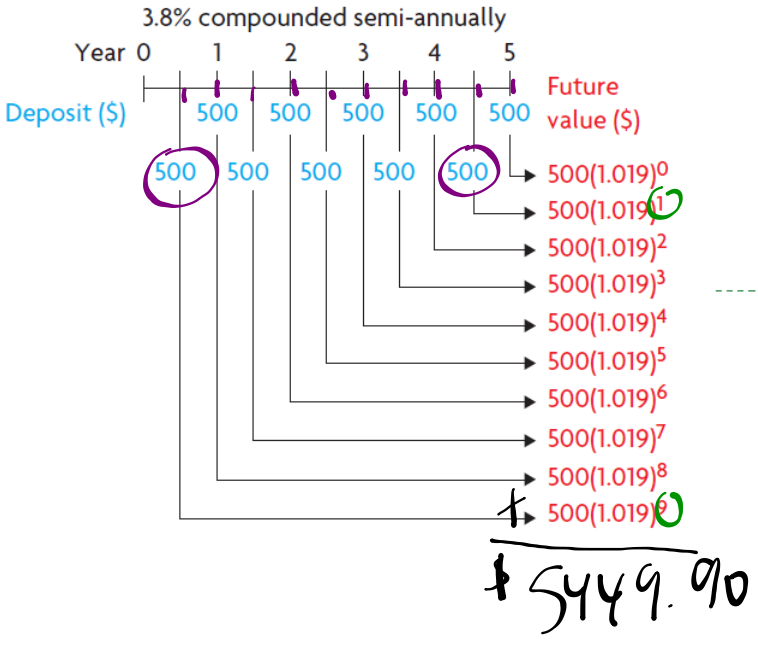
Determine the future value of an investment that earns compound interest involving regular payments.

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.



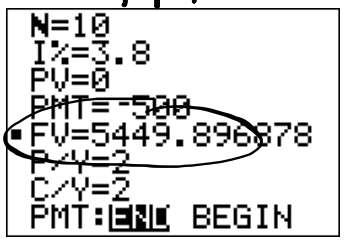
$5449.90

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

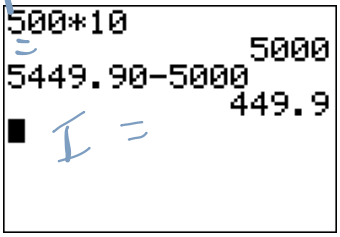
$A = 500(1.019)$

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

APP



Payout



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'

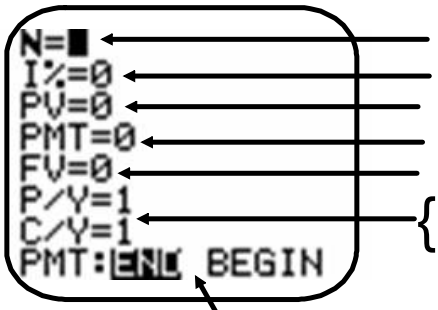
4.) Suppose you know you can afford a $250 per month payment on a 60 month loan at 6% annual interest compounded monthly. Fill out the TVM Solver screen as shown:

```
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)...



Total number of payments
Yearly interest rate (as a percent)
Present Value (money invested/borrowed)
Payment
Future Value (money at the end of the term)
Number of payments/year
Number of times interest gets compounded/year

Payment is given at the beginning/end of pay period

Pay Out = PMT x N

HOMEWORK: Review questions...

p. 483 - #1, 2, 5, 7, 10

Attachments

Notes - TVM Solver.pdf