HOMEWORK... *Questions...*

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)**
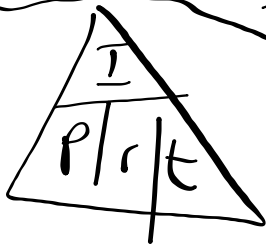
#4, #6, #7, & #9

Simple Interest

$$I = Prt$$
$$A = P + I \rightsquigarrow$$
$$A = P + Prt$$
$$A = P(1 + rt)$$

$$I = A - P$$

Triangle:
$$\frac{I}{P \mid r \mid t}$$

Compound Interest

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

Rate of Return

$$ROR = \frac{\$earn}{\$invest} \times 100\%$$

Rule of 72

Double $\longrightarrow$

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

Present Value

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

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

a) 6%   b) 12%

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

a) $t = \dfrac{72}{6}$

$t = 12$ years

b) $t = \dfrac{72}{12}$

$t = 6$ years

Total $\Rightarrow$ 12 years $\times 4$

$= 48$ years

Total $\Rightarrow 6 \times 4$

$= 24$ years

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

12. 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 time → bank loans money and makes interest

b) 10 yrs   5yrs & 5yrs

$A = 5000(1+\frac{0.0325}{1})^{10}$

A
```
5000(1+0.0325)^1
0
        6884.471519
```
$6884.47

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

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.

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

$$\overset{\$}{=} 48357.03$$

4 years

Reinvest $\longrightarrow$

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

$$A = \overset{\$}{54333.96}$$

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4. Mac plans to retire in 20 years, when he is 55. He estimates that he
   will need $250 000 to live on, until he is eligible for his pension.
   a) How much money should he invest now at 8.5% compounded
      annually, to meet his goal?
   b) How much interest will he earn in 20 years?

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

$P = \dfrac{250000}{\left(1 + \frac{0.085}{1}\right)^{1 \times 20}}$

$P = \$48\,904.10$

8.5 Investments Involving Regular Payments

GOAL

Determine the future value of an investment that earns compound interest involving regular payments.
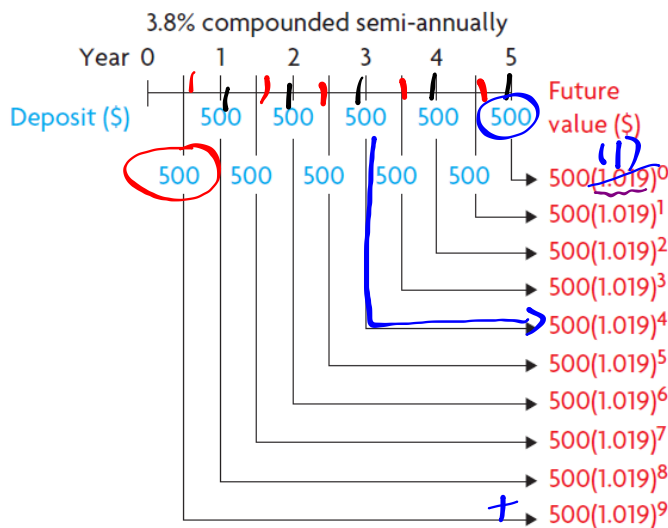
EXAMPLE 1 p. 485	Determining the future value of an investment involving regular deposits

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.

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

$$A = 500(1.019)$$

3.8% compounded semi-annually

Year 0   1   2   3   4   5   Future value ($)

Deposit ($)   500   500   500   500   500

500   500   500   500   500

- $500(1.019)^0$
- $500(1.019)^1$
- $500(1.019)^2$
- $500(1.019)^3$
- $500(1.019)^4$
- $500(1.019)^5$
- $500(1.019)^6$
- $500(1.019)^7$
- $500(1.019)^8$
- $500(1.019)^9$

> 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
```

$$\text{Pay Out} = 500 \times 10$$
$$= 5000$$

$5449.90 in 5 years

$$\text{Interest} = A - P$$
$$= 5449.90$$
$$- 5000$$
$$\overline{\quad 449.90 \quad}$$

HOMEWORK: Review questions...

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