

# HOMEWORK Questions...

p. 457: #1, 2

p. 468: #2, 6, 7

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## Simple

$$I = Prt$$

&

$$A = P + I$$

$$A = P + Prt$$

$$A = P(1 + rt)$$

## Compound

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

$$I = A - P$$

2. Determine the future value and the total interest earned for each investment.

a) \$520 invested for 8 years at 4.5% compounded monthly

b) \$1400 invested for 15 years at 8.6% compounded semi-annually

$I = A - P$

a)  $A = 520 \left( 1 + \frac{0.045}{12} \right)^{12 \times 8}$

A =  $520(1+0.045/12)^{96}$   
 744.8296201  
 Ans-520  
 224.8296201  
 I =

$A = \$744.83$   
 $I = \$224.83$

b)  $A = 1400 \left( 1 + \frac{0.086}{2} \right)^{2 \times 15}$

A =  $1400(1+0.086/2)^{30}$   
 4950.593742  
 Ans-1400  
 I = 3550.593742

## How to make money???



**EXAMPLE 4** Comparing interest on investments with different compounding periods  
**p. 463**

Céline wants to invest \$3000 so that she can buy a new car in the next 5 years. Céline has the following investment options:

- A. 4.8% compounded annually
- B. 4.8% compounded semi-annually \*
- C. 4.8% compounded monthly
- D. 4.8% compounded weekly
- E. 4.8% compounded daily



$$3000(1+0.048/1)^5 = 3792.518151$$

$$3000(1+0.048/2)^{10} = 3802.951801$$

$$3000(1+0.048/12)^{60} = 3811.922156$$

$$3000(1+0.048/52)^{(52*5)} = 3813.325288$$

$$3000(1+0.048/365)^{(365*5)} = 3813.687273$$

**Rule of 72**

A simple formula for estimating the doubling time of an investment; 72 is divided by the annual interest rate as a percent to estimate the doubling time of an investment in years.

The Rule of 72 is most accurate when the interest is compounded annually.

p. 465

**EXAMPLE 5** Estimating doubling times for investments

Both Berta and Kris invested \$5000 by purchasing Canada Savings Bonds. Berta's CSB earns 8%, compounded annually, while Kris's CSB earns 9%, compounded annually.

- a) Estimate the doubling time for each CSB.

$$\text{Rule of 72} = \frac{72}{\text{Rate}}$$

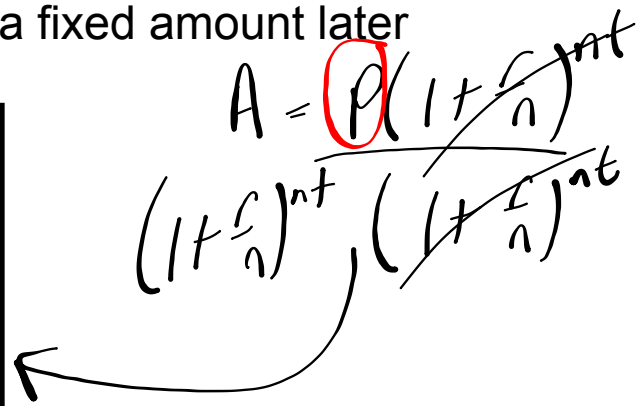
Berta (8%) vs Kris (9%)

$$\frac{72}{8} = 9 \text{ years} \quad \frac{72}{9} = 8 \text{ years}$$

## Present Value...

\$ needed to invest NOW to get a fixed amount later

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

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


# 8.4

## Compound Interest: Present Value

**GOAL**

Determine the principal or present value of an investment, given its future value and compound interest rate.

**EXAMPLE 2**  
p. 475

Determining the present value of an investment that is compounded quarterly

Agnes and Bill are musicians. They have researched the costs to set up a small recording studio. They estimate that \$40 000 will pay for the soundproofing, recording equipment, and computer hardware and software that they need. They plan to set up the studio in 3 years and have invested money at 9.6%, compounded quarterly, to save for it.



- a) How much money should they have invested? **P?**
- b) How much interest will they earn over the term of their investment?

$$\begin{aligned}
 a) \quad P &= \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}} \\
 &= \frac{40000}{\left(1 + \frac{0.096}{4}\right)^{4 \times 3}}
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{40000}{\left(1 + 0.096/4\right)^{12}} \\
 &= 30092.65538 \\
 &= \boxed{\$30092.66}
 \end{aligned}$$

$$\begin{aligned}
 b) \quad I &= A - P \\
 &= 40000 \\
 &\quad - 30092.66 \\
 &\quad \hline
 &= \$9907.34
 \end{aligned}$$

## **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