

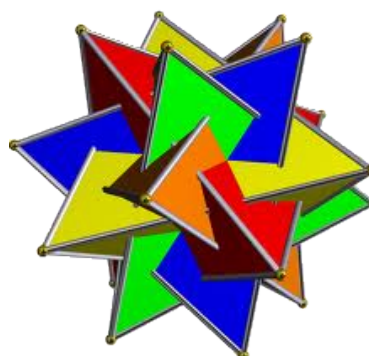
COMPOUND Interest...



SIMPLE



COMPOUND



Terminology Tango

daily
semi-annually
monthly
quartly



twice a year
four times a year
365 times a year
twelve times a year

[Click on the picture to verify the match.](#)

COMPOUND Interest



Allison wants to invest \$2000.00. His bank offers an investment option that earns **compound interest** at a rate of 1.75% per year compounded annually for 3 years.

Interest period	Investment value at beginning of period	Interest earned $I = Prt$	Investment value at end of period
1	\$2000	$\$2000 \times 0.0175 \times 1 = \35	\$2035
2	\$2035	$\$2035 \times 0.0175 \times 1 = \35.61	\$2070.61
3	\$2070.61	$\$2070.61 \times 0.0175 \times 1 = \36.24	\$2106.85



**COMPOUND
Interest**



Allison wants to invest \$2000.00. His bank offers an investment option that earns **compound interest** at a rate of 1.75% per year for ~~3~~ years.

10

Interest period	Investment value at beginning of period	Interest earned $I = Prt$	Investment value at end of period
1	\$2000	$\$2000 \times 0.0175 \times 1 = \35	\$2035
2	\$2035	$\$2035 \times 0.0175 \times 1 = \35.61	\$2070.61
3	\$2070.61	$\$2070.61 \times 0.0175 \times 1 = \36.24	\$2106.85

??

Take too long

COMPOUND Interest

Interest is added to the principal periodically throughout the year. New interest may be paid on the principal plus the interest. The interest rate is stated per annum and is divided by the number of **compounding periods**.

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

$$I = A - P$$

A = final value of the investment ...(principal + interest)

P = principal

r = annual interest rate

n = number of compounding periods in a year

t = term of the investment or loan in number of years

EXAMPLE #1: If \$1000 is invested at 8 %/a compounded semi-annually for 2 years, how much will the investment be worth?

Using the simple interest formula...

$$\begin{aligned} I &= 1000(0.08)(6/12) \\ &= \$40 \text{ (after 1st interest period)} \end{aligned}$$

$$\begin{aligned} \text{New principal} &= 1000 + 40 \\ &= \$1040 \end{aligned}$$

$$\begin{aligned} I &= 1040(0.08)(6/12) \\ &= \$41.60 \text{ (after 2nd interest period)} \end{aligned}$$

$$\begin{aligned} \text{New Principal} &= 1040 + 41.60 \\ &= \$1081.60 \end{aligned}$$

$$\begin{aligned} I &= 1081.60(0.08)(6/12) \\ &= \$43.26 \text{ (after 3rd interest period)} \end{aligned}$$

$$\begin{aligned} \text{New Principal} &= 1081.60 + 43.26 \\ &= \$1124.86 \end{aligned}$$

$$\begin{aligned} I &= 1124.86(0.08)(6/12) \\ &= \$44.99 \text{ (after 4th interest period)} \end{aligned}$$

$$\begin{aligned} \text{New Principal} &= 1124.86 + 44.99 \\ &= \$1169.85 \end{aligned}$$

Using the formula...

$$\begin{aligned} A &= P \left(1 + \frac{r}{n}i \right)^{nt} \\ &= 1000(1 + 0.08/2)^{2 \times 2} \\ &= \$1169.86 \end{aligned}$$

EXAMPLE #2:

Calculate the final value of an initial investment of \$6000.00. Interest is paid at 4% per annum, compounded semi-annually, for three years.

A = final value of the investment ...(principal + interest)
 P = principal
 r = annual interest rate
 n = number of compounding periods in a year
 t = term of the investment or loan in number of years

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

$$A = 6000 \left(1 + \frac{0.04}{2} \right)^{(2)(3)}$$

~~$$A = 6000(1 + 0.02)^6$$~~

~~$$A = 6000(1.02)^6$$~~

~~$$A = 6000(1.1262)$$~~

$$A = \$6756.98$$

EX #3: Maggie invests \$30 000 at 10% /a compounded quarterly for 20 years. Determine...

- a) How much will this investment be worth?
 b) How much interest did you earn?

$$a) \quad A = P \left(1 + \frac{r}{n} \right)^{nt} \quad \text{4} \cdot \text{20}$$

$$A = 30000 \left(1 + \frac{0.10}{4} \right)^{4 \cdot 20}$$

$$A = 216287.03$$

$$b) \quad I = A - P$$

$$= 216287.03 - 30000$$

$$= 186287.03$$

EXAMPLE #4...


A keen MVHS student wants to save some money from their summer employment. They decide to take out a Canada Savings Bond which pays 2.5 % interest per year compounded monthly. If the student invests \$850 into the bond, how much interest will they earn if they don't touch the money for 3 years?

$$A = 850 \left(1 + \frac{0.025}{12}\right)^{n \cdot 3}$$

$$= 916.13$$

$$\begin{aligned} \underline{I} &= 916.13 - 850 \\ &= 66.13 \end{aligned}$$

HOMEWORK...

 Worksheet - Introduction to Compound Interest.doc

Attachments

Worksheet - Introduction to Compound Interest.doc

3.2 Build Your Skills Detailed Solutions.pdf