COMPOUND INTEREST

REVIEW

Simple Interest

- Interest paid on ONLY the PRINCIPAL of an investment or loan.
- Has a LINEAR growth.

Compound Interest

- Interest paid on the Principal **AND** it's accumulated INTEREST.
- Calculated at regular compounding Periods and added to the principal for the next compounding period.
- Has an EXPONENTIAL growth.

COMPOUND INTEREST FORMULA $A = P(1 + i)^n$

A = Accumulated amount (or future value)

P = Principal (the initial amount)

i = interest rate per compounding period

n = number of compounding periods

Compounding Frequency Terminology

- Annually – once a year
- Semi-annually – 2 times per year (every 6 months)
- Quarterly – 4 times per year (every 3 months)
- Semi-monthly – 24 times per year (twice a month)
- Bi-weekly – 26 times per year (every 2 weeks)
- Weekly – 52 times per year (but **NOT** 4 times a month)

Interest Rate (i)

Calculate the interest rate (i) as it would appear in the compound interest formula.
(Hint: Convert to decimal and divide by the number of compounding periods)

a) 6% semi-annually

$0.06 \div 2$

$= 0.03$

b) 5% weekly

$0.05 \div 52$

$= 0.009615$

c) 1.75% quarterly

$= 0.0175 \div 4$

$= 0.004375$

Compounding Periods (n)

Calculate the number of compounding periods (n) as it would appear in the compound interest formula. *(Hint: multiply the length of time (in years) by the # of compounding periods in the compounding frequency)*

a) Compounded **quarterly** for 5 years

$5 \times 4 = 20$

b) Compounded **semi-annually** for 18 months

$2 \times \frac{18}{12} = 3$

c) Compounded **bi-weekly** for ~~8~~ 6 months

$26 \times \frac{6}{12} = 13$

EXAMPLE 1

a) Calculate the amount of a $500 investment, invested at 3% compounded quarterly for 3 years.

Type = quarterly
A = ?
P = 500
i = 3% = 0.03 ÷ 4 = 0.0075
n = 3 years × 4 = 12

$A = P(1+i)^n$
$= 500(1+0.0075)^{12}$
$= 546.90$
A = $546.90

b) How much interest was earned?

$A = P + I$
$546.90 = 500 + I$
$546.90 - 500 = I$

∴ $46.90 worth of interest was accumulated

EXAMPLE 2

Peter borrowed $5 000 to buy a used car. The interest rate on the loan was 5.45% per year, compounded monthly. He plans to repay the loan in four years.

a) How much must Peter repay?

Type = Compounded monthly
A = ?
P = 5000
i = 5.45%/a ÷ 12 = 0.004542
n = 4 years × 12 = 48

$A = P(1+i)^n$
$= 5000(1+0.004542)^{48}$
$= 6214.96$
∴ Peter must repay $6214.96

b) If Peter repays the loan 6 months early, how much interest will he save (not have to repay)?

Type = C.monthly
A = ?
P = 5000
i = 0.004542
n = 42

$A = P(1+i)^n$
$= 5000(1+0.004542)^{42}$
$= 6048.26$

6214.96 − 6048.26 = 166.7
Regular

∴ He'll save $166.7

EXAMPLE 3

Jennifer's investment has grown by an average of 12.6% per year, compounded annually, over the past seven years. How much would her investment of $2000 made ~~eight~~ seven years ago be worth today?

Type : compounded annually
A : ?
P : 2000
i : 0.126/a
n : 7 years

$A = P(1+i)^n$
$= 2000(1+0.126)^7$
$= 4589.85$
∴ Her investment is worth $4589.85

3 RULES OF THUMB FOR CALCULATING COMPOUND INTEREST

- Always identify the value of each variable first.
- Remember to use BEDMAS
- Keep all decimal places in your calculator and round to 2 decimal places at the end.