Changing Conditions on Investments & Loans Practice

1. Describe the difference between the graphs of $y = 400(1.05)^n$ and $y = 400(1.07)^n$ (without graphing).

$y = 400(1.07)^n$ would grow faster because the growth rate is greater.

2. For a $1 500 investment, at 7% per year, compounded semi-annually, compare the final amounts **and** total interest after each of the following terms.

a) Three years

T: comp. semi-annually
A: ?
P: 1500
i: 0.07 year ÷ 2
n: 3 years x 2
J = A − P = $343.88

$A = P(1+i)^n$
$= 1500(1+0.07\div 2)^6$
$= \$1843.88$

b) Four years

T: com. semi-annual
A: ?
P: 1500
i: 0.07 ÷ 2 = 0.035
n: 4 years x 2 = 8
$A = P(1+i)^n = 1500(1+0.035)^8$
$= \$1975.21$
$I = 1975.21 - 1500 = \$475.21$

c) Five years

T: com. semi-an
A: ?
P: 1500
i: 0.07 ÷ 2 = 0.035
n: 5 x 2 = 10
$A = 1500(1+0.035)^{10}$
$= \$2115.90$
$I = 2115.90 - 1500 = \$615.90$

∴ The longer the more

3. Bruno borrows $1 000 from a high interest lender (loan shark) at 105% per year, compounded daily. How much interest will Bruno pay if he takes

a) 1 month to pay off the loan

T : daily
A : ?
P : 1000
i : 1.05 year ÷ 365
n : 1 month = 30 days
$A = 1000(1+1.05\div 365)^{30}$
$= \$1089.99$
$I = \$89.99$

∴ Bruno pays $89.99 interest

b) 2 months to pay off the loan

$A = 1000(1+1.05\div 365)^{61}$
$= \$1191.52$
$I = 1191.52 - 1000$
$= \$191.52$

∴ he pays $191.52 interest

4. A $675 investment earns interest at 3.4% per year, compounded semi-annually, for five years. How will the **investment amount** be affected if you **double**

a) the interest rate
b) the total term of the investment (length of time)

Type: Comp. Semi-annually
A : ?
P : 675
i : 0.034 year ÷ 2 = 0.017
n : 5 years x 2 = 10
$A = 675(1+0.017)^{10}$
$= \$798.94$

a) DOUBLE RATE
T : semi-an
A : ?
P : 675
i : 0.017 x 2 = 0.034
n : 10
$A = 675(1+0.034)^{10}$
$= \$942.99$

b) DOUBLE TIME
A : ?
P : 675
i : 0.017
n : 20
$A = 675(1+0.017)^{20}$
$= \$945.63$

5. Soo Yun hopes to have $3 000 in two years to buy a home theatre system. Determine the amount she would **need to invest** (i.e., present value) to reach her goal at

a) 4% per year, compounded semi-annually

T : semi
A : 3000
P : ?
i : 0.04 ÷ 2 = 0.02
n : 2 years x 2 = 4

$P = A(1+i)^{-n}$
$= 3000(1+0.02)^{-4}$
$= \$2771.54$

∴ She needs to invest $2771.54

b) 5% per year, compounded semi-annually

T , semi
A : 3000
P : ?
i : 0.05 ÷ 2 = 0.025
n : 2 years x 2 = 4

$P = A(1+i)^{-n}$
$= 3000(1+0.025)^{-4}$
$= 2717.85$

∴ She needs to invest $2717.85

6. Jamie wants to invest $14 000 for 6 years. Calculate the future value of her investment for

a) 5.8% per year, simple interest

I :
P : 14000
r : 0.058
t : 6 years
$I = Prt$
$= 14000(0.058)6$
$= \$4872$

$A = 14000 + 4872$
$= \$18872$

b) 5.5% per year, compounded semi-annually

T : semi
A : ?
P , 14,000
i , 0.055 ÷ 2 = 0.0275
n : 6 years x 2 = 12
$A = 14000(1+0.0275)^{12}$
$= \$19386.97$

c) 5.0% per year, compounded monthly

T : monthly
A : ?
P : 14000
i : 0.05 ÷ 12
n : 6 years x 12 = 72
$A = 14000(1+0.05 \div 12)^{72}$
$= \$18,886.25$

7. Your friend Steve does not understand the difference between some possible investment options, each with a different compounding period. To help him, calculate the future value of a $10 000 investment over 10 years at 8% per year for each compounding period.

a) Annually
b) Semi-annually
c) Quarterly
d) Monthly
e) Bi-weekly
f) Weekly

T : annual
A : ?
P : 10,000
i : 0.08
n : 10 years
$A = 10000(1+0.08)^{10}$
$= \$21589.25$

T : semi
A : ?
P : 10000
i : 0.08 ÷ 2
n : 10 x 2
$A = 10000(1+0.08 \div 2)^{20}$
$= \$21911.23$

T : Quarterly
A : ?
P : 10000
i : 0.08 ÷ 4
n : 10 x 4
$A = 10,000(1+0.08 \div 4)^{40}$
$= \$22080.40$