# CHAPTER 2

## Solutions to Chapter-End Problems

**A. Key Concepts**

Simple Interest:

**2.2** P = 3000

#### N = 6 months

#### i = 0.09 per year

= 0.09/12 per month, or 0.09/2 per six months

P + I = P + PiN = P(1 + iN)

= 3000[1 + (0.09/12)(6)] = 3135

*or*

= 3000[1 + (0.09/2)(1)] = 3135

The total amount due is $3135, which is $3000 for the principal amount and $135 in interest.

**2.6 (a)** P = 1000

i = 0.10 per year

N = 2 years

F = P(1+i)N = 1000(1+0.10)2 = 1210

The balance at the end of 2 years will be €1210.

**(b)** P = 900

i = 0.12 per year = 0.01 per month

N = 2 years = 24 months

F = P(1+i)N = 900(1+0.01)24 = 1142.76

The balance at the end of 24 months (2 years) will be €1143.

**2.8** F = P(1 + i)N

50 000 = 20 000(1 + i)20

(1+i)20 = 5/2

i = (5/2)1/20 − 1 = 0.04688 = 4.688% per quarter = 18.75% per year

The investment certificate would have to pay at least 18.75% nominal interest, compounded quarterly.

Cash Flow Diagrams:

**2.14** F = P(1 + i)N

50 000 = 20 000(1 + 0.02)N

(1.02)N = 5/2

###### N = ln(5/2)/ln(1.02) = 46.27 quarters = 11.57 years

Greg would have to invest his money for about 11.57 years to reach his target.

**2.16**  First, we shift the time reference point from now to three years ago (i.e.,

P = 500 000 and F = 650 000). The computations relating the two amounts remain unchanged. Then the formula F = P(1 + i)N must be solved in terms of i to answer the question: i = (F/P)1/N − 1.

**(a)** With a compounding period of one year, the number of periods is

N = 3. This gives:

i = (F/P)1/N − 1 = (650 000/500 000)1/3 − 1 = 0.09139

The annual interest rate earned was approximately 9.14%.

**(b)** With a compounding period of one month, the number of periods is

N = 36. This gives:

i = (F/P)1/N − 1 = (650 000/500 000)1/36 − 1 = 0.007315

The monthly interest rate earned was approximately 0.73%. On an annual basis this would be stated as (0.73)(12) = 8.76% (nominal) interest.

**2.18** P = 500

F = 708.31

i = 0.01 per month

From: F = P(1 + i)N

N = ln(F/P)/ln(1 + i) = ln(708.31/500)/ln(1 + 0.01) = 35.001

The deposit was made 35 months ago.

**2.20** Let P = X and F = 2X.

**(a)** By substituting F = 2X and P = X into the formula, F = P + I = P + PiN, we get

2X = X + XiN = X(1 + iN)

2 = 1 + iN

iN = 1

N = 1/i = 1/0.11 = 9.0909

It will take 9.1 years.

**(b)** From F = P(1 + i)N, we get N = ln(F/P)/ln(1 + i). By substituting F = 2X and P = X into this expression of N,

N = ln(2X/X)/ln(1 + 0.11) = ln(2)/ln(1.11) = 6.642

Since compounding is done every year, the amount will not double until the 7th year.

**(c)** Given r = 0.11 per year, the effective interest rate is i = er − 1 = 0.1163.

From F = P(1 + i)N, we get N = ln(F/P)/ln(1 + i). By substituting F = 2X and P = X into this expression of N,

N = ln(2X/X)/ln(1 + 0.1163) = ln(2)/ln(1.1163) = 6.3013

Since interest is compounded continuously, the amount will double after 6.3 years.