Financial Word Problems

$\div 100 = 0.1125$

Ex 1: If you invest any amount of money at 11.25% compounded quarterly, determine how long will it take the money to double.

$n = 4$

$A = P(1 + \frac{r}{n})^{nt}$ where A = amount of investment at the end
P = amount of investment at the start
r = interest rate (as a decimal)
n = number of compounding periods per year
t = time in years

$$2 = 1\left(1 + \frac{0.1125}{4}\right)^{4t}$$

$$\frac{\log 2}{4\log\left(1+\frac{0.1125}{4}\right)} = \frac{\cancel{4}t\log\cancel{\left(1+\frac{0.1125}{4}\right)}}{\cancel{4}\log\cancel{\left(1+\frac{0.1125}{4}\right)}}$$

$$6.248 = t$$

years

Ex 2: Determine how many monthly investments of $200 would have to be made into an account that pays 6% annual interest, compounded monthly, to obtain at least $100,000.
Express your answer as a whole number.

R

$$FV = \frac{R[(1 + i)^n - 1]}{i}$$

where FV = future value

R = investment amount each period

$$i = \frac{\text{annual interest rate}}{\text{number of compounding periods per year}} \qquad \frac{0.06}{12} = 0.005$$

n = number of investments

$$100000 = \frac{200\left[\boxed{(1.005)^n} - 1\right]}{0.005}$$

$$\frac{100\,000}{40000} = \frac{40000}{40000}\left[(1.005)^n - 1\right] \qquad \frac{500}{200} = \frac{200}{200}\left[(1.005)^n - 1\right]$$

$$2.5 = 1.005^n - 1 \qquad 2.5 = 1.005^n - 1$$

$$3.5 = 1.005^n$$

$$\frac{\log 3.5}{\log 1.005} = \frac{n \log 1.005}{\log 1.005}$$

$$251.178 = n$$

n = 252 payments (Total payments)

251 ← (Full payments)

Ex 3: A person borrows $15000 to buy a car. The person can afford to pay $300 a month. The loan will be repaid with equal monthly payments at 6% annual interest, compounded monthly. Given that the last payment will be a partial payment, determine how many full monthly payments the person will have to make. Express your answer as a whole number.

$$PV = \frac{R[1 - (1 + i)^{-n}]}{i}$$

where PV = present value of the amount borrowed

R = amount of each periodic payment

$$i = \frac{\text{annual interest rate}}{\text{number of compounding periods per year}}$$

n = number of equal periodic payments

$$15000 = \frac{300[1-(1.005)^{-n}]}{0.005}$$

$$0.25 = 1 - (1.005)^{-n}$$

$$-0.25 \qquad -0.25$$

$$+(1.005)^{-n} \qquad +(1.005)^{-n}$$

$$(1.005)^{-n} = 0.75$$

$$\frac{-n\log(1.005)}{-\log(1.005)} = \frac{\log(0.75)}{(-\log(1.005))}$$

$n = 57$

full payments

p.434

#1, 3, 6, 7, 8, 12

CI FV PV PV