Ex 5.4

Q1 Mortgage 200000 (monthly) 30 yrs at 6% = 0.06.

$(1+r)^{12} = 1.06$ 30 yrs = 360 payments

$r = (1.06)^{1/12} - 1$

$r = 0.004868$

$$\text{Payment} = 200{,}000 \frac{(0.004868)(1+0.004868)^{360}}{(1+0.004868)^{360} - 1}$$

$= 1178.81$ per month.

Q2 20 yrs = 240 months

8% per annum $(1+r)^{12} = 1.08$

$r = 1.08^{1/12} - 1$

$r = 0.006434$

856 per month.

$$850 = P \times \frac{(0.006434)[1+0.006434]^{240}}{(1+0.006434)^{240} - 1}$$

$850 = P(0.008191479961)$

$103766 = P$

$= €103{,}800$ of a Mortgage

Q3 Mortgage = €75,000 8% annual = 0·08.

$(1+r)^{12} = 1{\cdot}08$

$r = 1{\cdot}08^{1/12} - 1$

$r = 0{\cdot}006434$

(a) 20 yrs = 240 months

$$A = 75000 \times \frac{(0{\cdot}006434)(1+0{\cdot}006434)^{240}}{(1+0{\cdot}006434)^{240} - 1}$$

$A = 614{\cdot}36 = 614$ nearest euro.

$614 \times 240 = 147360$

$147,360 - 75,000 = 72,360$ Interest.

(b) 25 yrs = 300 months

$$A = 75000 \times \frac{(0{\cdot}006434)(1+0{\cdot}006434)^{300}}{(1+0{\cdot}006434)^{300} - 1}$$

$A = 565$ to nearest euro

$565 \times 300 = 169500$

$169500 - 75000 = 94,500$ Interest

(c) 30 yrs = 360 months

$$A = 75000 \frac{(0.006434)(1+0.006434)^{360}}{(1+0.006434)^{360} - 1}$$

$A = 536$ to nearest Euro

$536 \times 360 = 192960$

$192960 - 75000 = 117,960$ interest.

Q4 €15,000 car

Plan A: 10% discount ⇒ 1500 off
⇒ new cost = 13,500

∴ 9% for 5 Yrs 0.09.

$$A = 13500 \times \frac{(0.09)(1+0.09)^5}{(1+0.09)^5 - 1}$$

= 3470 per yr

Plan B 15,000 for 5 yrs at 3% = 0.03.

$$A = 15000 \times \frac{(0.03)(1+0.03)^5}{(1+0.03)^5 - 1}$$

= 3275 per yr.

⇒ Plan B is better.

Q5 saved €250000 25yrs 5% = 0.05

$$A = 250000 \times \frac{(0.05)(1+0.05)^{25}}{(1+0.05)^{25}-1}$$

$A = 17,738.11$ per yr.

Q6 200,000 now

25 annual payments of 15,000.

Option 1 200,000 invested for 25yrs at 5%

$$F = P(1+i)^t$$
$$F = 200,000(1+0.05)^{25}$$
$$= 677270.99.$$

Option 2

$$F = 15000(1.05) + 15000(1.05)^2 + \cdots 15000(1.05)^{25}$$

$$S_n = \frac{a(1-r^n)}{1-r} \qquad a = 15000(1.05), \quad r = 1.05, \quad n = 25$$

$$F = \frac{15000(1.05)\left[1-(1.05)^{25}\right]}{(1-1.05)}$$

$$= 751701.81$$

$\Rightarrow$ Option 2 is better.

Q7 400 per month for 3 yrs (= 36 months)

6·6% per annum = 0·066

$(1+r)^{12} = 1.066$

$r = 1.066^{1/12} - 1$

$r = 0.00534$ monthly.

$$400 = \frac{P(0.00534)(1+0.00534)^{36}}{(1+0.00534)^{36} - 1}$$

$400 = P(0.030607)$

$13068.84 = P$