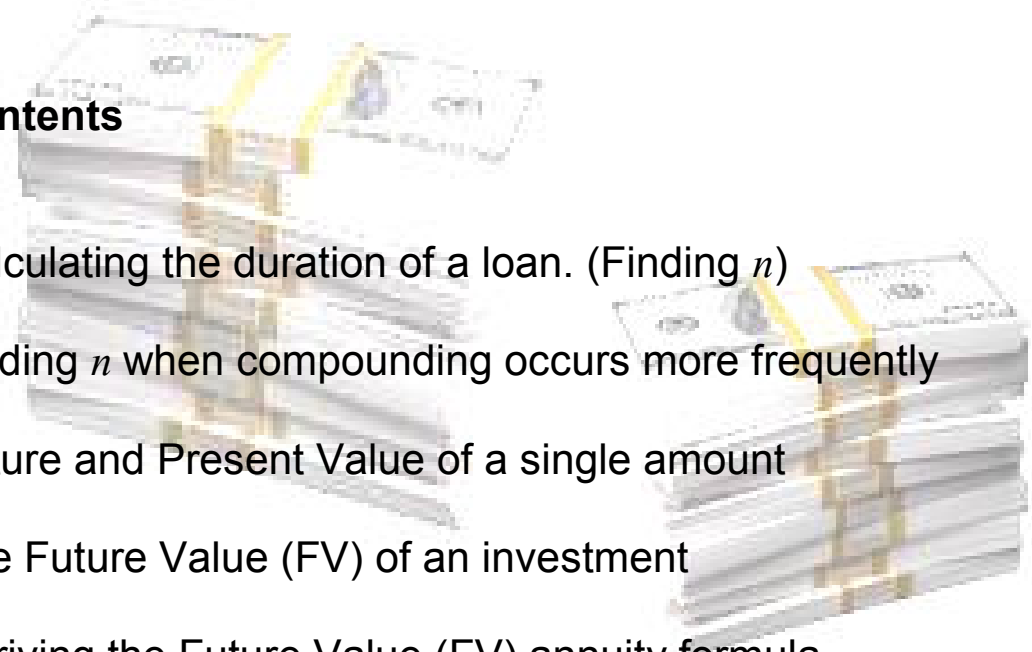


Name:

Class:

Sample Financial Mathematics

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2

Calculating the duration of a loan. (Finding n)

- 1) Peter invests R5000 in an account at 10% per annum compounded your answer in years correct to 2 decimal places.

Solution

Write down the known quantities:

$$P = 5000 \quad i = 0,1 \quad A = 10000 \quad A = P(1+i)^n$$

$$\begin{aligned} \therefore 5000(1+0,1)^n &= 10000 && \text{Now divide both sides by 5000} \\ \therefore (1,1)^n &= 2 && \text{Next take logs of both sides} \\ \therefore \log(1,1)^n &= \log 2 && \text{Apply the law: } \log x^n = n \log x \\ \therefore n \log(1,1) &= \log 2 && \text{Now divide both sides by } \log(1,1) \\ \therefore n &= \frac{\log 2}{\log(1,1)} \\ \therefore n &= 7,2725 \end{aligned}$$

i.e. The investment will take 7,27 years to double.

Note: Expressed in years, months and days: $7,2725 \approx 7$ years, 3 months and 8 days.

Finding n when compounding occurs more frequently

- 2) Peter invests R5000 in an account at 10% per annum compounded **monthly**. How long will it take for the investment to double? Give your answer in years correct to 2 decimal places.

Solution Again write down the known quantities

$$i = 0,1 \div 12 = 0,008\dot{3} \quad (\text{The **monthly** interest rate})$$

The exponent in the formula $A = P(1+i)^n$ refers to the **number of times** interest is calculated. Here it is 12 times a year for n years. i.e. $12n$

$$\begin{aligned} \therefore 5000(1+0,008\dot{3})^{12n} &= 10000 && \text{Now divide both sides by 5000} \\ \therefore (1,008\dot{3})^{12n} &= 2 && \text{Next take logs of both sides} \end{aligned}$$

$$\therefore \log(1,008\dot{3})^{12n} = \log 2$$

$$\therefore 12n \log(1,008\dot{3}) = \log 2$$

$$\therefore 12n = \frac{\log 2}{\log(1,008\dot{3})}$$

$$\therefore 12n = 83,5237559$$

$$\therefore n = 6,96$$

Apply the law:

Now divide both sides by

Use 6 decimal places i.e.
1,008333 for greater accuracy.
Or enter the fraction as: $\frac{121}{120}$