Question 6   **(25 marks)**

(a)   Donagh is arranging a loan and is examining two different repayment options.
     (i)   Bank A will charge him a monthly interest rate of 0·35%. Find, correct to three
           significant figures, the annual percentage rate (APR) that is equivalent to a monthly
           interest rate of 0·35%.

     (ii)   Bank B will charge him a rate that is equivalent to an APR of 4·5%. Find, correct to
           three significant figures, the monthly interest rate that is equivalent to an APR of 4·5%.

(b)   Donagh borrowed €80 000 at a monthly interest rate of 0·35%, fixed for the term of the loan,
        from Bank A. The loan is to be repaid in equal monthly repayments over ten years. The first
        repayment is due one month after the loan is issued. Calculate, correct to the nearest euro, the
        amount of each monthly repayment.

Question 6 (25 marks)

(a) Donagh is arranging a loan and is examining two different repayment options.

(i) Bank A will charge him a monthly interest rate of 0·35%. Find, correct to three significant figures, the annual percentage rate (APR) that is equivalent to a monthly interest rate of 0·35%.

$$F = P(1 + i)^t = 1(1 + 0 \cdot 0035)^{12} = 1 \cdot 042818$$
$$\Rightarrow i = 4 \cdot 28\%$$

(ii) Bank B will charge him a rate that is equivalent to an APR of 4·5%. Find, correct to three significant figures, the monthly interest rate that is equivalent to an APR of 4·5%.

$$F = P(1 + i)^t$$
$$1 \cdot 045 = 1(1 + i)^{12}$$
$$1 + i = \sqrt[12]{1 \cdot 045} = 1 \cdot 0036748$$
$$\Rightarrow i = 0 \cdot 367\%$$

(b) Donagh borrowed €80 000 at a monthly interest rate of 0·35%, fixed for the term of the loan, from Bank A. The loan is to be repaid in equal monthly repayments over ten years. The first repayment is due one month after the loan is issued. Calculate, correct to the nearest euro, the amount of each monthly repayment.

$$A = P \left[\frac{i(1+i)^t}{(1+i)^t - 1} \right]$$

$$= 80000 \left[\frac{0 \cdot 0035 (1 \cdot 0035)^{120}}{(1 \cdot 0035)^{120} - 1} \right]$$

$$= 80000 \left[\frac{0 \cdot 00532296}{0 \cdot 520846} \right]$$

$$= 817 \cdot 59 = €818$$

(b) Scale 15C (0, 5, 10, 15) – NOTE: two solutions
1st solution

Low Partial Credit:
• Any correct step, i.e. correct formula

High Partial Credit:
• Substitution in correct formula.

or

$$80000 = \frac{A}{1 \cdot 0035} + \frac{A}{1 \cdot 0035^2} + \ldots + \frac{A}{1 \cdot 0035^{120}}$$

$$= A \left[\frac{1}{1 \cdot 0035} + \frac{1}{1 \cdot 0035^2} + \ldots + \frac{1}{1 \cdot 0035^{120}} \right]$$

$$= A \left[\frac{\frac{1}{1 \cdot 0035} \left(1 - \left(\frac{1}{1 \cdot 0035} \right)^{120} \right)}{1 - \frac{1}{1 \cdot 0035}} \right]$$

$$= A \left[\frac{0 \cdot 342471198}{0.0035} \right]$$

$$= A \left[97 \cdot 8489137 \right]$$

$$A = 817 \cdot 58 = €818$$

(b) Scale 15C (0, 5, 10, 15) – NOTE: two solutions
2nd solution

Low Partial Credit:
• Correct equation.
• Listing some terms • Some substitution

High Partial Credit:
• Complete substitution and effort at evaluation.

Note: If A and 80 000 interchanged and remainder of work correct, may get High Partial credit.

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