

Question 5

(25 marks)

- (a) A couple agree to take out a €250 000 mortgage in order to purchase a new home. The loan is to be paid back monthly over 25 years with the repayments due at the end of each month. The bank charges an annual percentage rate (APR) which is equivalent to a monthly rate of 0.287%.
- Using the amortisation formula, or otherwise, find the couples' monthly repayment on the mortgage. Give your answer in euro correct to the nearest cent.
- (b) Another couple agree to take out a mortgage of €350 000, at a rate of 0.3% per month, in order to purchase a new home. This loan is also to be paid back monthly over 25 years with the repayments due at the end of each month. The amount of each repayment is €1771.
- After exactly 11 years of repayments, the couple receive a financial windfall. They decide to repay the remaining balance on the mortgage.
- Write down a **series** (including the first two and last two terms) which shows the total of the present values of all the remaining monthly repayments due over the remaining 14 years of the mortgage (after the last monthly repayment at the end of year 11).
- Hence**, find how much the couple will need to repay in order to clear their mortgage entirely. Give your answer correct to the nearest cent.

Q5	Model Solution – 25 Marks	Marking Notes
(a)	$A = \frac{250000(0.00287)(1.00287)^{300}}{(1.00287)^{300} - 1}$ $A = €1244.06$ <p style="text-align: center;">Or</p> $\frac{A}{1.00287^1} + \frac{A}{1.00287^2} + \dots + \frac{A}{1.00287^{300}}$ $= 250000$ $A \left[\frac{\frac{1}{1.00287} \left(\frac{1}{1.00287}^{300} - 1 \right)}{\frac{1}{1.00287} - 1} \right] = 250000$ $200.9544372 \times A = 250000$ $A = €1244.06$	<p>Scale 15C (0, 5, 10, 15)</p> <p><i>Low Partial Credit:</i> Formula with some correct substitution (1.00287) 300</p> <p><i>High Partial Credit:</i> Formula fully substituted</p>
(b)	$\frac{1771}{1.003} + \frac{1771}{1.003^2} + \dots + \frac{1771}{1.003^{167}}$ $+ \frac{1771}{1.003^{168}}$ $S_{168} = \frac{\frac{1771}{1.003} \left[\left(\frac{1}{1.003} \right)^{168} - 1 \right]}{\frac{1}{1.003} - 1}$ $= €233438.25$	<p>Scale 10D (0, 3, 5, 8, 10)</p> <p><i>Low Partial Credit:</i> $\frac{1771}{1.003}$ 168</p> <p><i>Mid Partial Credit:</i> S_{168} formula with some substitution</p> <p><i>High Partial Credit:</i> Formula fully substituted</p>