



- TG 3** At the start of a month, Jo opens a bank account and makes a deposit of \$500. At
14 16b the start of each subsequent month, Jo makes a deposit which is 1% more than
M the previous deposit. At the end of each month, the bank pays interest of 0.3%
(per month) on the balance of the account.
- (i) Explain why the balance of the account at the end of the second month is **2**
 $\$500(1.003)^2 + \$500(1.01)(1.003)$.
- (ii) Find the balance of the account at the end of the 60th month, correct to **3**
the nearest dollar.

(i) Deposits: $500, 500(1.01), 500(1.01^2), \dots$

Let A_n = balance of account after n months

$$A_1 = 500(1.003)$$

$$\begin{aligned} A_2 &= 500(1.003)(1.003) + 500(1.01)(1.003) \\ &= 500(1.003)^2 + 500(1.01)(1.003) \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad A_3 &= A_2(1.003) + 500(1.01)^2(1.003) \\ &= 500(1.003^3) + 500(1.01)(1.003)^2 + 500(1.01)^2(1.003) \\ &= 500[1.003^3 + (1.01)(1.003)^2 + (1.01)^2(1.003)] \\ A_{60} &= 500[1.003^{60} + (1.01)(1.003)^{59} + \dots + (1.01)^{59}(1.003)] \end{aligned}$$

Geometric series, $a = 1.003^{60}$, $r = \frac{1.01}{1.003}$, $n = 60$

$$A_{60} = 500 \left(\frac{1.003^{60} \left[\left(\frac{1.01}{1.003} \right)^{60} - 1 \right]}{\frac{1.01}{1.003} - 1} \right)$$

$$= 44\,404.37866\dots$$

$$= 44\,404 \text{ (nearest whole)}$$

\therefore the balance is \$44 404.

State Mean:

1.00

1.14

* These solutions have been provided by [projectmaths](http://projectmaths.com.au) and are not supplied or endorsed by NESA.

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(i) Most candidates were able to explain at least one of the terms in the expression given for the bank balance at the end of the second month. The explanation was expressed mathematically with excellent use of brackets to show cause and effect or using words to explain.

Common problems were:

- re-writing or expanding the given answer
- explaining only one of the terms in the given expression.

(ii) Most candidates attempted this question, realising that the response involved the summation of a geometric series.



Common problems were:

- not finding the common ratio from a correct series for A_{60} ;
- incorrectly splitting the series for A_{60} into two separate series, one involving $(1.01)^n$ and the other $(1.003)^n$;
- incorrectly identifying the value of 'a' from their series;
- omitting the factor of $(1.01)^n$ in their series.

http://www.boardofstudies.nsw.edu.au/hsc_exams/2014/pdf_doc/2014-maths.pdf