

# Amortisation tables



**Year 12 General Maths  
Units 3 and 4**

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## Learning Objectives

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By the end of the lesson, I would hope that you have an understanding and be able to apply to questions the following concepts:

- To be able to apply the amortisation process.
- To be able to construct an amortisation table.
- To be able to analyse an amortisation table for a reducing balance loan.
- To be able to read and interpret an amortisation table for an annuity to find the interest rate.
- To be able to interpret and construct an amortisation table for a compound interest investment with additions to the principal.



## Recap

It seems to appear that the following formula is pretty much all we need to know for General Maths.

$$V_0 = \text{Principal}, \quad V_{n+1} = R \times V_n \pm D, \quad \text{where } R = 1 \pm \frac{r}{100}$$

However, we are now going to diverge for a small while and look at something which used to be delivered to everyone each month.

It was something we all spent ages looking over to make sure that we hadn't had money stolen from us.

We called it a **bank statement** but General Maths wants it to be called an **Amortisation Table**.



BankStatements.net

Contact tel 03457 404 404  
see reverse for call times  
Text phone 03457 125 563  
used by deaf or speech impaired customers  
www.hsbc.co.uk

Your Statement

Mr John Doe  
20 Sherwood St,  
London W1F 7ED



Account Summary	
Opening Balance	0.57
Payments In	9,820.00
Payments Out	9,803.54
Closing Balance	17.03

International Bank Account Number  
ABCDHBUK0000001234567894  
Branch Identifier Code  
JUBKGB12345F

15 October to 14 November 2020

Account Name  
Mr John Doe

Sortcode Account Number Sheet Number  
40-25-02 123456979 16

Your Bank Account Details				
Date	Payment type and details	Paid out	Paid in	Balance
14 Oct 20 15 Oct 20	BP BALANCE BROUGHT FORWARD GBCLONLTD construction C Florea For help Victor Popa BP For my V Dumitru For help V Birca Fie help G Grajdian BP For help C Florea For rent BP Victor Popa For my Oct 20 BP D CHITAN Gift Oct 20 BP Victor Spinei For help Victor Popa For my BP Victor Spinei For help CR VICTOR POPA for my BALANCE CARRIED FORWARD			0.57
				9,000.00
				1,225.00
				1,900.00
				5,875.57
				1,710.00
				600.00
				2,565.57
				1,000.00
				2,000.57
				560.00
				1,440.57
				360.00
				500.00
				60.00
				70.00
				590.57

127 High Street Hounslow Middlesex TW3 1QP

## Amortisation tables

These are effectively ways to show the current state of a loan or investment. At the moment we will look at one for a loan.

The most important thing to note is:

$$\text{Principal reduction} = \text{Payment} - \text{Interest}$$

Payment number	Payment	Interest	Principal reduction	Balance	Principal amount of the loan
0	0.00	0.00	0.00	1000.00	
1	250.00	12.50	237.50	762.50	
2	250.00	9.53	240.47	522.03	
3	250.00	6.53	243.47	278.56	

Monthly (or other) payment

How much interest has been charged on the previous balance

How much the loan has been reduced by



## Amortisation tables: Finding the rate of interest

A common question in exams is to find the rate of interest from an Amortisation table.

We can use the formula:

$$\text{Interest per compounding period} = \frac{\text{Amount of interest charged}}{\text{Balance from previous payment}} * 100\%$$

1.25% of 278.56

$$1.25 \div 100 \times 278.56$$

Payment number	Payment	Interest	Principal reduction	Balance
0	0.00	0.00	0.00	1000.00
1	250.00	12.50	237.50	762.50
2	250.00	9.53	240.47	522.03
3	250.00	6.53	243.47	278.56

4

250.00

So, for the previous example:

$$\text{Interest} = \frac{12.50}{1000} * 100\% = 1.25\% \text{ per compounding period}$$

It is very important to know that this is the rate per compounding period.



## Amortisation tables: What you will be asked for

It is common that they ask you to complete lines of an amortisation table. This is more common in SACs than exams, but it has been asked in exams before.

They would ask you to find:

Payment number	Payment	Interest	Principal reduction	Balance
0	0.00	0.00	0.00	1000.00
1	250.00	12.50	237.50	762.50
2	250.00	9.53	240.47	522.03
3	250.00	6.53	243.47	278.56

- Interest payments and rates of interest
- Final payments (which might be smaller than normal)
- Values of principal reductions given payments and interests
- Balances at any point given past balance and principal reductions



## Example: Amortisation tables

Flora borrows \$20 000 at an interest rate of 8% per annum, compounding annually. She makes annual payments of \$2500.

$$r = 8\%$$

a State the principal of the loan. **\$20 000**

b Calculate the initial interest charged on the principal. **\$1600**

c Determine the impact of the first annual payment to find the principal reduction. **900**

d Calculate the new balance.

e Complete the row in the table below with your calculations.

**8% of 20 000**

**1600**

Payment number	Payment	Interest	Principal reduction	Balance
1	2500.00	<b>1600</b>	<b>900</b>	<b>19 100</b>

$$20 000 - 900$$



## Example: Amortisation tables

Flora borrows \$20 000 at an interest rate of 8% per annum, compounding annually. She makes annual payments of \$2500.

Construct an amortisation table for Flora's reducing balance loan for the first three payments.

8% of 18 128

Payment Num	Payment	Interest	Principal reduction	Balance
0	\$0.00	\$0.00	\$0.00	\$20,000.00
1	2500	1600	900	19100.00
2	2500	1528	972	18128.00
3	2500	1450.24	1049.76	17078.24
4	2500			



## Example: Amortisation tables

A business borrows \$10 000 at a rate of 8% per annum, compounding quarterly. The loan is to be repaid by making quarterly payments of \$2700.00. The amortisation table for this loan is shown below.

$$\frac{8}{4} = 2\%$$

Payment number	Payment	Interest	Principal reduction	Balance
0	0.00	0.00	0.00	10 000.00
1	2700.00	200	2500.00	7500.00
2	2700.00	150.00	2550	4950.00
3	2700.00	99.00	2601.00	2349

- a Calculate the interest paid on the initial balance.
- b Calculate the principal reduction from the second payment.
- c Calculate the balance of the loan after payment 3 has been made.

2% of 10 000



## Example: Amortisation tables

Consider the following amortisation table for an annuity after 3 monthly payments.

Payment number	Payment	Interest	Principal reduction	Balance
0	0.00	0.00	0.00	12 000.00
1	2200.00	60.00	2140.00	9860.00
2	2200.00	49.30	2150.70	7709.30
3	2200.00	38.55 A	2161.45 B	5547.85

- a State the principal of the annuity and the amount of interest paid in the first month.
- b Calculate the monthly interest rate.
- c Find the value of A and B.

\$12 000, \$60

$$\frac{60}{12000} \times 100 \\ 0.5\%$$

$$A = 38.55 \\ B = 2161.45$$



## Amortisation tables for investments

These are pretty much the same as they were for loans and annuities however, here isn't a principal **reduction** there is a principal **increase**. The working out for all the other things is pretty much the same except:

Principal increase = Payment + Interest

As, when we have an investment, the interest is added on to the payment.

Payment number	Payment	Interest	Principal increase	Balance
0	0.00	0.00	0.00	1200.00
1	50.00	3.00	53.00	1253.00
2	50.00	3.13	53.13	1306.13
3	50.00	3.27	53.27	1359.40



## Example: Amortisation table for investments

Consider the following amortisation table for a compound interest investment with monthly additions to the principal. Assume that interest compounds monthly.

Payment number	Payment	Interest	Principal increase	Balance
0	0.00	0.00	0.00	1200.00
1	50.00	3.00	53.00	1253.00
2	50.00	3.13	53.13	1306.13
3	50.00	3.27	53.27	1359.40

Complete two additional lines for the table corresponding to payment 4 and payment 5.

Payment Num	Payment	Interest	Principal increase	Balance
4	50	3.40	53.40	1412.80
5	50			

$$r = \frac{3}{1200} \times 100 = 0.25\%$$

0.25% of 1359.40

0.25% of 1412.80



## VCAA Questions

Pina invests \$540 000 in an annuity paying 3% interest per annum, compounding monthly. Her annuity will provide a monthly payment of \$5214.28 for 10 years.

Four lines of the amortisation table for Pina's annuity are shown below.

The information for payment number 3 is missing.

- What is the value of payment number 3?
- Calculate the interest associated with payment number 3.  
Round your answer to the nearest cent.
- Let  $P_n$  be the balance, in dollars, of Pina's annuity after  $n$  months.

Write a recurrence relation, in terms of  $P_0$ ,  $P_{n+1}$  and  $P_n$ , that can model this balance from month to month.

Payment number	Payment (\$)	Interest (\$)	Principal reduction (\$)	Balance (\$)
0	0.00	0.00	0.00	540 000.00
1	5214.28	1350.00	3864.28	536 135.72
2	5214.28	1340.34	3873.94	532 261.78
3	5214.28	1330.65	3883.65	

VCAA 2022 Further Maths  
Exam 2  
Question 7

$$r = 0.25\%$$

$$l = 1 + \frac{0.25}{100}$$

$$V_0 = 540 000, V_{n+1} = 1.0025 V_n - 5214.28$$



## VCAA Questions

Deepa invests \$500 000 in an annuity that provides an annual payment of \$44 970.55

Interest is calculated annually.

The first five lines of the amortisation table are shown below.

The principal reduction associated with payment number 3 is

- A. \$17962.40
- B. \$25969.37
- C. \$27008.15
- D. \$28088.47
- E. \$44 970.55

VCAA 2021 Further Maths  
Exam 1  
Question 18

Payment number	Payment (\$)	Interest (\$)	Principal reduction (\$)	Balance (\$)
0	0.00	0.00	0.00	500 000.00
1	44 970.55	20 000.00	24 970.55	475 029.45
2	44 970.55	19 001.18	25 969.37	449 060.08
3	44 970.55	17 962.40	27 008.15	422 051.93
4	44 970.55	16 882.08	28 088.47	393 963.46



## VCAA Questions

Samuel has a reducing balance loan.

The first five lines of the amortisation table for Samuel's loan are shown below.

Interest is **calculated monthly** and Samuel makes monthly payments of \$1600.

Interest is charged on this loan at the rate of **3.6% per annum**.

VCAA 2020 Further Maths  
Exam 2  
Question 8

$$r = \frac{3.6}{12} = 0.3\%$$

a. Using the values in the amortisation table

- calculate the principal reduction associated with payment number 3
- calculate the balance of the loan after payment number 4 is made.

Round your answer to the nearest cent.

Payment number	Payment (\$)	Interest (\$)	Principal reduction (\$)	Balance (\$)
0	0.00	0.00	0.00	320 000.00
1	1600.00	960.00	640.00	319 360.00
2	1600.00	958.08	641.92	318 718.08
3	1600.00	956.15	643.85	318 074.23
4	1600.00	954.22	645.78	317 428.45



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