

VCE School Assessed Coursework: SAC

Students Name:

Sacred Heart College Yarrawonga



VCE Study:	Further Mathematics
Unit:	3
Outcomes:	1, 2 and 3
Assessment Task	Core SAC – Recursion and Financial Maths Part 1
Date:	Wednesday 18 th May 2022
Time:	5 mins reading 50 mins writing
Instructions:	Students to circle the correct answer on the answer sheet.
Conditions:	Silent, individual work
Permitted Materials:	Pens, Pencils, Ruler, Eraser, TIInspire CAS calculator, Bound Notes
Marks allocated:	20

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the room.

I understand I must not intentionally or unintentionally disclose any details on this SAC or imply what is or is not included, or in any way gain an unfair advantage for myself over other students. If I do, I understand that disciplinary action will occur and my result will be downgraded. In fairness to fellow students it is my responsibility to inform the VCE office if I am aware that information about the SAC is being passed on, or that a student has gained unfair advantage.

Student Signature:

Date:

Recursion and Financial Mathematics Multiple Choice SAC

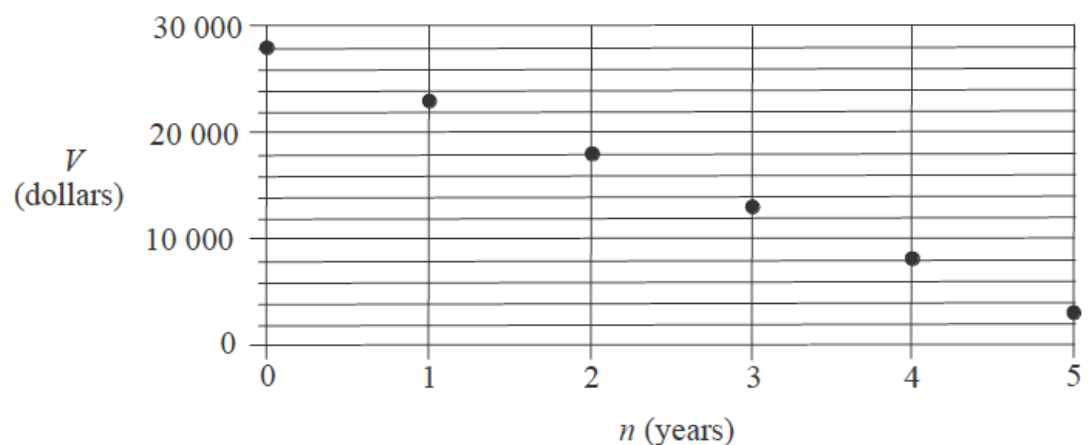
Question 1

For the recurrence relation given by $A_0 = 4$, $A_{n+1} = 2A_n - 5$, the value of A_3 is found by evaluating

- A. $2 \times 1 - 5$
- B. $2 \times 2 - 5$
- C. $2 \times 3 - 5$
- D. $2 \times 4 - 5$
- E. $2 \times 5 - 5$

Question 2

The graph below shows the value of an asset over five years.



Let V_n be the value of the asset, in dollars, after n years.

A rule for evaluating V_n could be

- A. $V_n = 28000 - 2500n$
- B. $V_n = 28000 \times 0.95^n$
- C. $V_n = 28000 - 5000n$
- D. $V_n = 28000 \times 1.05^n$
- E. $V_n = 28000 - 1.05n$

Question 3.

Consider the recurrence relation shown below.

$$V_0 = 25\,000, \quad V_{n+1} = 1.03V_n - 750$$

This recurrence relation could be used to model

- A. a reducing balance loan with periodic payments of \$750.
- B. reducing balance depreciation of an asset initially valued at \$25 000.
- C. flat rate depreciation of an asset initially valued at \$25 000.
- D. an annuity investment with periodic additions of \$750 made to the investment.
- E. an interest-only loan of \$25 000.

Question 4

Barb borrows \$180 000 to start a business.

The interest rate on the loan is 3.72% per annum compounding monthly.

Barb's monthly repayments will be \$2100.

A recurrence relation that models the balance of the loan, B_n , in dollars after n months is

- A. $B_0 = 180\,000, \quad B_{n+1} = 1.0372B_n$
- B. $B_0 = 180\,000, \quad B_{n+1} = 1.0031B_n$
- C. $B_0 = 180\,000, \quad B_{n+1} = 1.0372B_n + 2\,100$
- D. $B_0 = 180\,000, \quad B_{n+1} = 1.0031B_n - 2\,100$
- E. $B_0 = 180\,000, \quad B_{n+1} = 1.0372B_n - 2\,100$

Question 5

Naomi has a reducing balance loan. Six lines of the amortisation table for this loan are shown below.

Repayment number	Repayment	Interest	Principal reduction	Balance
11	1600.00	560.38	1039.62	69 007.30
12	1600.00	552.06	1047.94	67 959.36
13	1600.00	541.98	1058.02	66 901.34
14	1600.00	533.54	1066.46	65 834.88
15	1600.00	525.03	1074.97	64 759.91
16	1600.00	516.46	1083.54	63 676.37

After one of these repayments had been made, the interest rate on the loan was decreased by a very small amount. The last repayment made at the higher interest rate was repayment number

- A. 11
- B. 12
- C. 13
- D. 14
- E. 15

Question 6

Paul borrowed \$6000 from a bank and was charged interest compounding quarterly. After one year, having made no repayments, he owed the bank a total of \$6120.90. The rate of interest per annum charged by the bank and the effective annual interest rate are different. That difference is closest to

- A. 0.005%
- B. 0.015%
- C. 0.020%
- D. 0.025%
- E. 0.030%

Question 7

A multi-function printer is purchased for \$18 500 and depreciated using the unit cost method at the rate of 0.5 cents per copy printed.

After 640 000 copies have been printed, the unit cost method of depreciation is replaced by the reducing balance method of depreciation at the rate of r % per annum.

Two years after this change of depreciation method is implemented, the value of the multi-function printer is \$10 795.68.

The value of r is

- A. 8
- B. 9
- C. 10
- D. 12
- E. 16

Question 8

Louisa invests \$40 000 in an annuity investment.

The interest rate on this investment is 1.42% per annum compounding quarterly.

Louisa has a savings target of \$60 000 for this investment which she plans to reach in five years. To achieve this she adds an additional \$825 to the investment each quarter.

One year after her initial investment, the interest rate on Louisa's annuity investment drops to 1.26% per annum.

In order to still meet her savings target of \$60 000 in five years, the amount Louisa will have to increase her quarterly payment by is closest to

- A. \$0.39
- B. \$5.42
- C. \$19.40
- D. \$20.13
- E. \$62.68

Question 9

An appliance repairman charges \$80 to turn up and \$55 per minutes (or part thereof) working time to make home visits. The recurrence relation that models this situation is:

- A. $A_0 = 80, A_{n+1} = A_n + 55$
- B. $A_0 = 55, A_{n+1} = A_n + 80$
- C. $A_0 = 80, A_{n+1} = 0.55A_n$
- D. $A_0 = 80, A_{n+1} = 1.55A_n$
- E. $A_0 = 80, A_{n+1} = A_n - 55$

The following information relates to Questions 10 and 11

Kelly invested \$3000 in a term deposit that earns 4% per annum compounded quarterly.

Question 10

The recurrence relation that models this investment is:

- A. $V_0 = 3000, V_{n+1} = 1.04V_n$
- B. $V_0 = 3000, V_{n+1} = 0.01V_n$
- C. $V_0 = 3000, V_{n+1} = 0.04V_n$
- D. $V_0 = 3000, V_{n+1} = 4V_n$
- E. $V_0 = 3000, V_{n+1} = 1.01V_n$

The following information relates to Questions 18 and 19

Kelly invested \$3000 in a term deposit that earns 4% per annum compounded quarterly.

Question 18

The recurrence relation that models this investment is:

- A. $V_0 = 3000, V_{n+1} = 1.04V_n$
- B. $V_0 = 3000, V_{n+1} = 0.01V_n$
- C. $V_0 = 3000, V_{n+1} = 0.04V_n$
- D. $V_0 = 3000, V_{n+1} = 4V_n$
- E. $V_0 = 3000, V_{n+1} = 1.01V_n$

Question 11

After 2 years, Kelly has:

- A. \$3216.40
- B. \$3248.60
- C. \$3000.00
- D. \$4105.70
- E. \$3947.80

The following information relates to Questions 12, 13 and 14

Andrew takes a personal loan of \$5000 for a year which charges interest every month. The recurrence relation that models his loan is given below.

$$V_0 = 5000, \quad V_{n+1} = 1.0125V_n - 450$$

Question 12

The interest rate charged per annum is:

- A. 1.25%
- B. 12%
- C. 15%
- D. 1.5%
- E. 10.125%

Question 13

The amount of the loan after 4 months is:

- A. \$3822.90
- B. \$4220.15
- C. \$5000.00
- D. \$3420.70
- E. \$3013.45

Question 14

The interest charged in this loan is closest to:

- A. \$330.35
- B. \$450
- C. \$400
- D. \$416.60
- E. \$433.30

Question 15

A couple takes a home loan of \$450 000 from a bank. The bank charges interest at the rate of 8.7% per annum, compounded monthly.

The loan is repaid in 25 years.

The total amount of interest paid by the couple is:

- A. \$92100
- B. \$655311
- C. \$450000
- D. \$405000
- E. \$607200

Question 16

The recurrence relation $A_0 = 1200$, $A_{n+1} = 1.2A_n + 300$ models an investment over time. Which of the following is not true about this investment?

- A. The initial investment is \$1200.
- B. The investment after 3 periods of time is \$3165.60.
- C. \$300 is added after each period of time.
- D. The investment doubles at the end of the second period.
- E. The investment is not a linear model.

Question 17

Brenton takes out a loan of \$25 000 at an interest rate of 7.2% per annum compounding monthly. Every month he makes a payment of \$498 to repay the loan. Let L_n be the balance of the loan after n months. A recurrence relationship that can be used to model the balance of this loan is

- A. $L_0 = 25\,000$, $L_{n+1} = 1.006L_n - 498$
- B. $L_0 = 25\,000$, $L_{n+1} = 1.06L_n - 498$
- C. $L_0 = 25\,000$, $L_{n+1} = 1.072L_n - 498$
- D. $L_0 = 25\,000$, $L_{n+1} = 1.006L_n + 498$
- E. $L_0 = 25\,000$, $L_{n+1} = 1.0006L_n - 498$

Question 18

Jalal takes out a loan of \$30 000 to start up a mowing business. The loan has interest charged at 8.4% per annum interest compounding monthly. An amortisation table for the first 12 months of the loan, with some entries missing, is shown below:

Payment number (n)	Payment made (\$)	Interest charged (\$)	Reduction in loan balance (\$)	Balance of Loan (\$)
0	-	-	-	30,000.00
1	650.00	210.00	440.00	29,560.00
2	650.00	206.92	443.08	29,116.92
3	650.00	203.82	446.18	
4	650.00	200.70	449.30	28,221.43
5	650.00	197.55	452.45	27,768.98
6	650.00	194.38	455.62	27,313.37
7	650.00	191.19	458.81	26,854.56
8	650.00	187.98	462.02	26,392.54
9	650.00			
10	650.00	181.49	468.51	25,458.78
11	650.00	178.21	471.79	24,986.99
12	650.00	174.91	475.09	24,511.90

QUESTION 18

The balance of the loan after 3 months is closest to

- A. \$28 466.92
- B. \$28 670.74
- C. \$28 020.74
- D. \$28 263.10
- E. \$28 266.22

Question 19

$$C_0 = 1, \quad C_{n+1} = 2C_n - 3$$

The first five terms of the recurrence relation shown above are

- A. 1, -4, -11, -25, -53,...
- B. 1, -1, -5, -13, -29,...
- C. 1, -1, -5, -7, -11,...
- D. 2, 1, -1, -5, -13,...
- E. 2, -2, -1, -5, -7,...

Question 20

Hong invests \$16 000 in an account that pays interest at the rate of 4.8% per annum compounding monthly. Hong deposits the same amount to the account at the end of every month after interest has been calculated.

After two years the balance of the account is \$25 000.

The amount Hong deposited each month is closest to

- A. \$294.04
- B. \$368.23
- C. \$1 695.06
- D. \$4 427.02
- E. \$4 493.92

SHC Further Mathematics Unit 3 Recursion and Financial Maths

Answer Sheet for Multiple Choice Questions

Name: _____

***Please circle the correct answer.

Question					
1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E
14	A	B	C	D	E
15	A	B	C	D	E
16	A	B	C	D	E
17	A	B	C	D	E
18	A	B	C	D	E
19	A	B	C	D	E
20	A	B	C	D	E