

VCE School Assessed Coursework: SAC

Students Name:

Sacred Heart College Yarrawonga



VCE Study:	General Mathematics
Unit:	3
Outcomes:	1, 2 and 3
Assessment Task	Core SAC – Recursion and Financial Maths Part 2 Modelling Task
Date:	Tuesday 28 th May
Time:	10 mins reading 50 mins writing
Instructions:	Students to answer all questions in the spaces provided. Round to two decimal places unless instructed otherwise
Conditions:	Silent, individual work
Permitted Materials:	Pens, Pencils, Ruler, Eraser, TIInspire CAS calculator, Bound Notes
Marks allocated:	/34

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:

Question 1 (14 marks)

Jye and Riley have been running their studio for 3 years and now have the client base to expand to a larger gym. Their dream of opening “CORE FITNESS” is becoming a reality.

Jye finds the perfect place to open the new gym. He will need to borrow **\$420 000** to purchase the building and new equipment.

Jye is offered the following loans over a period of **20 years**:

Option 1

Phillips Principal Plus offers a **reducing balance loan** charging **4.2% p.a.** interest calculated monthly.

Option 2

Bryans' Borrowing Group will also offer a **reducing balance loan** which require quarterly payments with the relationship of:

$$B_0 = \$420\,000, B_{n+1} = 1.0105B_n - 7786.09$$

Option 3

Hollies Home Loans offers a **reducing balance loan** charging **4.22% p.a.** compounding weekly.

- a) Show that the nominal rate for **Bryans Borrowing Group** is 4.2% p.a. (1 mark)
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b) Find the **effective** interest rate for the **Hollies Home Loans** option. Round to two decimal places. (1 mark)

c) Use Finance Solver to find the monthly payments Jye must pay if he borrows money with "Phillips Principal Plus"(Complete the table and give the answer below) (2 marks)

N	I(%)	PV	Pmt	FV	PpY, CpY

d) Jye made 239 payments and his final payment was a fraction less than the other payments. What was Jye's final payment? (1 mark)

e) What was the cost of this loan? (i.e. the total payments) (1 mark)

f) Hence, calculate how much interest Jye would pay if he borrowed from "Phillips Principal Plus". (1 mark)

g) Use Finance Solver to find the monthly payments Jye must pay if he borrows money with "Hollies Home Loans"(Complete the table and give the answer below) (2 marks)

N	I(%)	PV	Pmt	FV	PpY, CpY

h) Jye made 239 payments and his final payment was a fraction less than the other payments. What was Jye's final payment? (1 mark)

i) What was the cost of this loan? (i.e. the total payments) (1 mark)

- j) Hence, calculate how much interest Jye would pay if he borrowed from “Hollies Home Loans”. (1 mark)

- k) Which of these options (Hollies Home Loans or Phillips Principal Plus) should Jye borrow the money off and why? (2 marks)

Jye continues to run ‘CORE FITNESS’ whilst competing in body building contests.

Question 2 (6 marks)

Jye found a better loan with fortnightly repayments of \$1190.37 through **Mansfield Mortgage Masters.**

- a) Use Finance Solver to find the per annum interest rate charged when the \$420 000 loan is repaid in 20 years. Round to two decimal places (2 marks)

N	I(%)	PV	Pmt	FV	PpY, CpY

b) What is the value of the loan after 5 years? (1 mark)

N	I(%)	PV	Pmt	FV	PpY, CpY

5 years after beginning the loan with Mansfield Mortgage Masters Jye wins **\$70,000** at a major competition and decides to make a lump sum payment towards his loan with the prize money.

c) What is the new balance of Jye's loan after making the lump sum payment? (1 mark)

e) If Jye keeps the length of his loan the same his fortnightly payment will decrease. What is the new fortnightly repayment required to repay the loan amount in the 15 remaining years? (1 mark)

Fitness and body building have always been an important part of Jye's life. It helped him save for his first studio, allowed him to pay off his gym loan faster and gave him his winning physique.

Question 3 (4 marks)

Jye wants to share his love of body building with others and decides to start an annual amateur body building competition.

He wants to set up a **perpetuity investment account** that will pay the competition winner **\$15 000**. He secures an interest rate of **6% p.a.**

a) How much does Jye need to invest into the account to maintain a **\$15 000** prize each year? (1 mark)

b) What will the balance of the investment account be 10 years after it began? Explain your answer. (2 marks)

c) What prize money could Jye award if he invested \$350 000 at an interest rate of 8% p.a. (1 mark)

Jye, starts to think about planning for his retirement.

Question 4 (5 marks)

Now age 40, Jye begins looking for an account that allows him to make additional **weekly payments** in order to grow the balance quickly. Jye wants to retire with at least **\$1 000 000 at age 65**.

Jye has settled on the following figures:

Deposit: \$200 000

Interest rate: 1.75% p.a

Weekly payments: \$400

- a) Will Jye reach his goal of having at least \$1 000 000 at retirement?
Justify your choice. (2 marks)

- b) What adjustment could Jye make to either (choose one) his deposit or weekly payments to ensure he has exactly \$1 000 000 when he retires? (3 marks)

Jye retires the minute his investment account reaches \$1 000 000. (His body ain't what it used to be).

Question 5 (6 marks)

Jye transfers the entire **\$1 000 000** into an annuity account which will provide a monthly payment of **\$4435.97**.

The first 3 lines of his annuity are outlined in the following amortisation table.

<i>Payment number</i>	<i>Regular withdrawal</i>	<i>Interest earned</i>	<i>Principal reduction</i>	<i>Balance of investment</i>
<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1 000 000</i>
<i>1</i>	<i>4435.97</i>	<i>2000</i>	<i>2435.97</i>	<i>997 564.03</i>
<i>2</i>	<i>4435.97</i>	<i>1995.13</i>	<i>2440.84</i>	<i>995 123.19</i>

a) Determine the monthly interest rate for the annuity account. (1 mark)

b) What is the annual interest rate? (1 mark)

The following amortisation table show payments 30-32 of Jye's annuity.
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<i>Payment number</i>	<i>Regular withdrawal</i>	<i>Interest earned</i>	<i>Principal reduction</i>	<i>Balance of investment</i>
30	4435.97	1854.69	A	924 761.52
31	4435.97	B	2586.45	922 175.07
32	4435.97	1844.35	C	D

c) Determine the missing values A, B, C & D for the above amortisation table. (4 marks)
