

1.3 Financial Applications

Question Paper

Course	DPIB Maths
Section	1. Number & Algebra
Topic	1.3 Financial Applications
Difficulty	Medium

Time allowed: 80
Score: /64
Percentage: /100

Question 1a

At the start of 2021 Maro wants to open a savings account. Bank A offers him an account with 3.5% annual simple interest with an initial deposit of \$5000, and Bank B offers him an account with 2.5% nominal annual interest with an initial deposit of \$4000, **compounding annually**. The interest for both accounts is paid in monthly deposits.

- (a) Calculate the amount of money Maro would have saved by the start of 2030 if he opens the Bank A account.

[2 marks]

Question 1b

- (b) Calculate the amount of money Maro would have saved by the start of 2035 if he opens the Bank B account.

[2 marks]

Question 1c

- (c) Find the year in which the amount in the Bank B account would surpass the amount in the Bank A account.

[3 marks]

Question 2a

Daniel and Jonah have each been given \$5000 to save for university.

Daniel invests his money in an account that pays a nominal annual interest rate of 2.24%, **compounded quarterly**.

(a) Calculate the amount Daniel will have in his account after 8 years. Give your answer to 2 decimal places.

[3 marks]

Question 2b

Jonah wants to invest his money in an account such that his investment will double in 10 years. Assume the account pays a nominal annual interest of $r\%$, **compounded half-yearly**.

(b) Determine the value of r .

[3 marks]

Question 3a

Alice buys a new coffee machine for \$4499. The value of the coffee machine depreciates by 9% each year.

- (a) Find the value of the coffee machine after 5 years. Give your answer correct to 2 decimal places.

[2 marks]

Question 3b

- (b) Find the number years and months it will take for the value of the coffee machine to be approximately \$999.

[3 marks]

Question 3c

The shop offers Alice a finance option in the form of a 1 year loan. Terms of the loan are:

- a 17.2% nominal annual interest rate, **compounded monthly**
- repayments to be made each month

(c) Find the cost of each monthly repayment. Give your answer correct to 2 decimal places.

[2 marks]

Question 4a

A new car costs \$20 000 and its value depreciates to \$14 792 after 2 years.

(a) Calculate

- (i) the annual rate of depreciation of the car
- (ii) the value of the car after 5 years. Give your answer correct to 2 decimal places.

[3 marks]

Question 4b

(b) Find the number of years and months it will take for the car's value to be approximately \$4000.

[3 marks]

Question 4c

Gus purchases the new car from a dealership who offers him a finance option in the form of a 3 year loan. Terms of the loan are:

- a 9% nominal annual interest rate, **compounded monthly**
- repayments to be made each month

(c) Find the monthly repayment that would have to be made. Give your answer correct to 2 decimal places.

[2 marks]

Question 5a

In this question, give all answers to two decimal places.

Biddy decides to purchase a new van from a dealership which costs \$18 000, however she cannot afford the full amount.

The dealership offers her a finance option in the form of a 4 year loan. Terms of the loan are:

- a 12% nominal annual interest rate, **compounded quarterly**
- a 15% deposit
- repayments to be made each quarter

(a) Calculate the loan amount Biddy would receive.

[2 marks]

Question 5b

(b) (i) Find the repayment that would have to be made each quarter.

(ii) Find the total amount paid for the van.

[5 marks]

Question 6a

In this question, give all answers to two decimal places.

On his 40th birthday, Robert invests \$15 000 into a savings account that pays a nominal annual interest rate of 4.78%, **compounded monthly**.

- (a) (i) Write an expression for the total value of the investment after n years.
- (ii) Find the total amount in the savings account after 3 and 5 years.

[3 marks]

Question 6b

- (b) Find the age Robert will be when the amount of money in his account is 1.5 times the initial amount.

[2 marks]

Question 6c

Robert would earn the same amount of interest, **compounded quarterly**, for 5 years if he deposits his money in a second savings account.

(c) Calculate the nominal annual interest rate from the second savings account.

[3 marks]

Question 7a

Fraser decides to invest in a retirement plan for 25 years. In this plan, he will deposit \$500 at the end of every month, on which he will receive 5.5% nominal annual interest, **compounded monthly**.

(a) Find the value of the investment at the end of the 25 years. Give your answer correct to 2 decimal places.

[3 marks]

Question 7b

After the 25 year period, Fraser will start receiving regular monthly payments of \$1250.

(b) Find the number of years it will take for Fraser's monthly retirement payments to match the total value of the investment at the end of the 25 years.

[2 marks]

Question 7c

(c) Find the number of years it will take for Fraser's monthly retirement payments to match the total amount he invested.

[3 marks]

Question 8a

In this question, give all answers to two decimal places.

Lily takes a mortgage of \$220 000 to purchase a house at a nominal annual interest rate of 4.18%, **compounded monthly**. She agrees to pay the bank \$1600 at the end of every month to amortise the loan.

(a) Find

- (i) the number of years and months it will take Lily to pay back the loan
- (ii) the total amount that Lily will pay to purchase the house.

[4 marks]

Question 8b

Lily wants to pay off the loan within 10 years.

(b) Calculate the new monthly payment required to do this and justify this decision.

[3 marks]

Question 9a

At the beginning of each year, Nala invests \$2500 in a savings account that pays a nominal annual rate of 3.5%, **compounded half-yearly**.

(a) Find the number of years it will take until Nala has \$80 000 in her account.

[3 marks]

Question 9b

At the beginning of each year, Jessica invests \$3500 in a savings account that pays a nominal annual interest rate of $r\%$, **compounded quarterly**. After 20 years Jessica has \$120 000 in her account.

(b) Determine the value of r .

[3 marks]