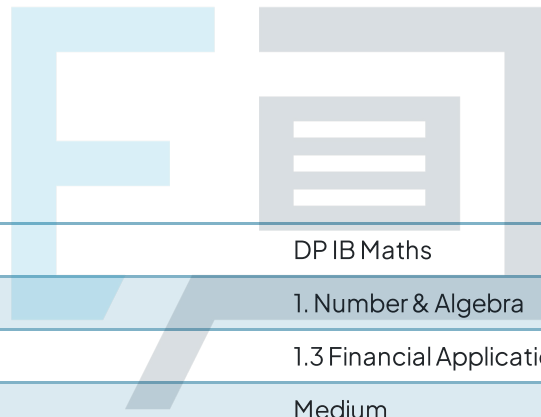




1.3 Financial Applications

Question Paper



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

Exam Papers Practice

To be used by all students preparing for DP IB Maths AI SL
Students of other boards may also find this useful

Question 1a

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

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.

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

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

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**.

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**.

Determine the value of r .

[3 marks]



Exam Papers Practice

Question 3a

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

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

[2 marks]

Question 3b

Find the number of 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

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.

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

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

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

[2 marks]

Exam Papers Practice

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

Calculate the loan amount Biddy would receive.

[2 marks]

Question 5b

(i)

Find the repayment that would have to be made each quarter.

(ii)

Find the total amount paid for the van.

[5 marks]



Exam Papers Practice

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.

(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

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.

Calculate the nominal annual interest rate from the second savings account.

[3 marks]

Exam Papers Practice

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**.

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.

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

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

[3 marks]



Exam Papers Practice

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.

Find

(i)
the number of years and months it will take Lily to pay back the loan

(ii)
the total amount Lily will pay to purchase the house.

[4 marks]

Question 8b

Lily wants to pay off the loan within 10 years.

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

[3 marks]

Exam Papers Practice

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.

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.

Determine the value of r .

[3 marks]



Exam Papers Practice