

Student Name

Mathematics Stage 5 Core

FINANCIAL MATHEMATICS A

Book 3 Solve problems involving spending money

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OVERVIEW

SYLLABUS CONTENT

MA5-FIN-C-01 solves financial problems involving simple interest, earning money and spending money

Solve problems involving spending money

- Calculate the cost of buying items on terms, by paying an initial deposit and making regular repayments
- Examine payment options involving buy now, pay later and investigate the costs associated with these schemes for purchasing goods
- Examine the principles behind short-term loans involving small dollar amounts and compare borrowing costs associated with using these products

LOAN REPAYMENTS

- When borrowing money, you need to plan to repay it to avoid growing debt.
- A payment plan involves **regular equal repayments** over a period of time.

$$\text{Repayment} = \text{Total to be repaid} \div \text{Number of repayments}$$

Example Calculating loan repayments.

A bank offers you a loan of \$24 000 at 16% p.a. simple interest.
 You are required to pay back the loan on equal monthly repayments over 5 years.

How much interest is charged on the loan?

$$I = Prn$$

$$I = \$24000 \times 0.16 \times 5$$

$$I = \$19200$$

What is the total amount of the loan including interest?

$$A = P + I$$

$$= \$24000 + \$19200$$

$$= \$43200$$

Calculate the size of each monthly repayment.

$$\begin{aligned} \text{Repayment} &= \text{Total to be repaid} \div \text{Number of repayments} \\ &= \$43200 \div (5 \text{ years} \times 12) \\ &= \$720 \text{ per month} \end{aligned}$$

A bank offers you a loan of \$500 000 at 8% p.a. simple interest. You are required to pay back the loan on equal monthly repayments over 30 years.

a Calculate the interest charged on the loan.

$$I = Prn$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

1 200 000

b Calculate the total amount of the loan including interest.

$$A = P + I$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

1 700 000

c Calculate the size of each monthly repayment.

$$\begin{aligned} \text{Repayment} &= \text{Total to be repaid} \div \text{Number of repayments} \\ &= \dots\dots\dots \\ &= \dots\dots\dots \end{aligned}$$

\$4722.22

- 1** Deals4U offers a loan of \$5000 at 20% p.a. simple interest.
You are required to pay back the loan on equal monthly repayments over 5 years.

- a** Calculate the interest charged on the loan.

$$I = Prn$$

\$5000

- b** Calculate the total amount of the loan including interest.

$$A = P + I$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$10 000

- c** Calculate the size of each monthly repayment.

$$\text{Repayment} = \text{Total to be repaid} \div \text{Number of repayments}$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$166.67

- 2** FastMoney offers a loan of \$6500 at 10% p.a. simple interest.
You are required to pay back the loan on equal monthly repayments over 6 years.

- a** Calculate the interest charged on the loan.

$$I = Prn$$

\$3900

- b** Calculate the total amount of the loan including interest.

$$A = P + I$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$10 400

- c** Calculate the size of each monthly repayment.

$$\text{Repayment} = \text{Total to be repaid} \div \text{Number of repayments}$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$144.44

3 Complete the table.

Amount borrowed	Annual interest rate	Number of Years	Interest	Total to be repaid	Monthly repayment
\$1000	10%	10	\$1000	\$2000	\$16.67
\$2000	10%	10	\$2000	\$4000	\$33.33
\$5000	10%	10	\$5000	\$10000	\$83.33
\$5000	20%	10	\$10000	\$15000	\$125
\$5000	20%	20	\$20000	\$25000	\$104.17
\$5000	20%	5	\$5000	\$10000	\$166.67
\$5000	20%	50	\$50000	\$55000	\$91.67

4 Charlotte borrows \$9000 to buy a second-hand car.
The loan must be repaid over 5 years at 12% p.a. simple interest.
How much is the monthly repayment?

\$240

BUYING ON TERMS

- Buying on terms lets you spread the cost over time. You pay a **deposit** and **regular repayments (also called instalments)** that include part of the item's cost and interest on the borrowed amount.
- The total cost is more than buying upfront because you're paying extra for the convenience of spreading payments. The seller adds interest to cover their risk and make profit from lending you money.

$$\text{Total paid} = \text{Deposit} + \text{Number of instalments} \times \text{Instalment amount}$$

Example Calculate costs when buying on terms.

A camping set costs \$998 and can be bought on terms for a \$99 deposit and 24 monthly instalments of \$55.

Calculate the total you will pay for the camping set.

$$\text{Total paid} = \text{Deposit} + \text{Number of instalments} \times \text{Instalment amount}$$

$$= \$99 + 24 \times \$55$$

$$= \$1419$$

How much would you save if you bought it upfront with cash?

$$\text{Savings} = \text{On terms cost} - \text{Upfront cost}$$

$$= \$1419 - \$998$$

$$= \$421$$

A snow skiing set costing \$742 can be bought on terms for \$75 deposit and 24 monthly instalments of \$34.

- a** Calculate the total you will pay for the snow skiing set.

$$\text{Total paid} = \text{Deposit} + \text{Number of instalments} \times \text{Instalment amount}$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$891

- b** How much would you save if you bought it upfront with cash?

$$\text{Savings} = \text{On terms cost} - \text{Upfront cost}$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

\$149

A \$699 surfboard can be bought on terms for \$79 deposit and 24 monthly instalments of \$33.

- a** Calculate the total you will pay for the surfboard.

\$871

- b** How much would you save if you bought it upfront with cash?

\$172

- 1** A laptop computer costing \$2298 can be bought on terms for \$229 deposit and 18 monthly repayments of \$135.60.

- a** Calculate the total cost of buying the computer on terms.

Total paid = Deposit + Number of instalments $\times$ Instalment amount

=

=

\$2669.80

- b** How much would you save by paying upfront?

Savings = On terms cost – Upfront cost

=

=

\$371.80

- 2** A home theatre system costing \$1598 can be bought on the following terms: 10% deposit and 48 weekly instalments of \$37.15.

- a** Calculate the total cost of buying the theatre system on terms.

Total paid = Deposit + Number of instalments $\times$ Instalment amount

=

=

\$1943

- b** How much would you save by paying upfront?

Savings = On terms cost – Upfront cost

=

=

\$345

- 3** A sound system costing \$879 can be bought on the following terms: 15% deposit and 26 fortnightly repayments of \$39.98.

- a** Calculate the total cost of buying the sound system on terms.

Total paid = Deposit + Number of instalments $\times$ Instalment amount

=

=

\$1171.33

- b** How much would you save by paying upfront?

Savings = On terms cost – Upfront cost

=

=

\$292.33

- 4** A surround sound system can be bought for \$998 cash or on the following terms:
Deposit \$99, with the balance to be repaid over 2 years in 24 equal monthly repayments.
Simple interest is charged at 9% p.a. on the balance.

- a** Calculate how much is owed after the deposit is paid.

$$\text{Balance owing} = \$998 - \$99 = \dots\dots\dots$$

\$899

- b** Calculate the interest charged on the balance owing.

$$I = PRN = \$899 \times \dots\dots \times \dots\dots = \$ \dots\dots\dots$$

\$161.82

- c** Calculate the total amount owing including interest.

$$\text{Total owing} = \text{Balance owing} + \text{interest}$$

$$= \dots\dots\dots + \dots\dots\dots$$

$$= \dots\dots\dots$$

\$1060.82

- d** Calculate the monthly repayment.

$$\text{Monthly repayment} = \text{Total owing} \div \text{number of repayments}$$

$$= \dots\dots\dots \div \dots\dots\dots$$

$$= \dots\dots\dots$$

\$44.20

- 5** Peter buys a second-hand car advertised for \$9600 on the following terms:
Deposit \$2000, the balance to be repaid over 2 years in equal monthly repayments.
Simple interest is charged at 12% p.a.

- a** Calculate how much is owed after the deposit is paid.

\$7600

- b** Calculate the interest charged on the balance owing.

\$1824

- c** Calculate the total amount owing including interest.

\$9424

- d** Calculate the monthly repayment.

\$392.67

- 6** Marta buys a computer costing \$780. She pays a 15% deposit and then pays the remainder of the cost over 12 months at 8% interest. How much will Marta pay for the computer in total?
- \$833.04
- 7** Ed buys a washing machine costing \$650. He pays a 10% deposit,
- a** How much does Ed still owe?
- \$585
- b** Ed pays 5% interest on the remaining amount, how much does Ed owe after interest is added?
- \$614.25
- c** Ed pays the amount he owes in 12 equal monthly instalments. Work out how much Ed pays each month.
- \$51.19
- 8** A large screen TV set can be bought for \$2998 cash or on the following terms: deposit \$299, with the balance to be repaid over 2 years in 24 equal monthly repayments. Simple interest is charged on the balance at 12% p.a. The TV is bought on terms.
- a** Calculate the balance owing after the deposit is paid.
- \$2699
- b** Calculate the interest charged on the balance owing.
- \$647.76
- c** What is the monthly repayment?
- \$139.45
- 9** Angela buys a motorbike advertised for \$12 900 on the following terms: deposit \$3000, the balance to be repaid over 3 years in equal monthly repayments. Simple interest is charged at 9% p.a. What is the monthly repayment?
- \$349.25

- 10** A computer costing \$1498 can be bought on terms for \$300 deposit and 36 monthly repayments of \$46.50.

- a** Calculate the total cost of buying the computer on terms.

$$\text{Total cost} = \text{Deposit} + \text{Number of instalments} \times \text{Instalment amount}$$

$$= \$300 + 36 \times \$46.50$$

$$= \dots\dots\dots$$

- b** Find the total amount of interest charged.

$$\text{Interest} = \text{Total cost} - \text{Purchase price}$$

$$= \$1974 - \$1498$$

$$= \dots\dots\dots$$

- c** Calculate how much is owed after the deposit is paid.

This is the amount of money “borrowed”.

$$\text{Balance owing} = \$1498 - \$300 = \dots\dots\dots$$

- d** Calculate the annual rate of interest charged.

$$I = Prn$$

$$\$476 = \$1198 \times r \times 3$$

$$\$476 = \dots\dots\dots \times r$$

$$r = \dots\dots\dots = \dots\dots\dots\%$$

13.24%

- 11** A lounge suite is advertised for \$5990 or \$500 deposit and 48 monthly repayments of \$187.58.

- a** Calculate the total cost of buying the lounge suite on terms.

\$9503.84

- b** Find the total amount of interest charged.

\$3513.84

- c** What was the amount of money borrowed?

\$5490

- d** Calculate the annual rate of interest charged.

16%

12 A \$1499 camera can be bought on terms for \$200 deposit and 24 monthly repayments of \$74.69. Calculate the annual rate of interest charged.

a Calculate the total cost of buying the camera on terms.

\$1992.56

b Find the total amount of interest charged.

\$493.56

c What was the amount of money borrowed?

\$1299

d Calculate the annual rate of interest charged.

19%

13 2009 HSC Standard 2 Band 5

Lou bought a plasma TV which was priced at \$3499.

He paid \$1000 deposit and got a loan for the balance that was paid off by 24 monthly instalments of \$135.36.

What simple interest rate per annum, to the nearest percent, was charged on his loan?

15%

BUY NOW PAY LATER (BNPL)

- Many shops offer **buy now pay later (BNPL)** schemes through some company.
- These schemes are interest-free but charge large fees for late repayments.

$$\text{Total paid} = \text{Number of instalments} \times \text{Instalment amount}$$

- Each Buy Now Pay Later provider (AfterPay, ZipPay etc.) has different terms and conditions.
- BNPL firms make their money from late fees and take a cut of your purchase from the retailer. The retailer is happy to pay the cut, as BNPL firms encourage more spending.

Example Buy now pay later.

A pair of shoes is \$300. You choose to use a buy now pay later scheme to purchase the shoes. You must pay 4 instalments of \$75 every two weeks.

How much interest do you pay?

$$\text{Total paid} = \text{Number of instalments} \times \text{Instalment amount}$$

$$= 4 \times \$75$$

$$= \$300$$

You don't pay any interest!

If you are late in your repayments, you must pay a fee of 25% of the original order value, or \$68, whatever is less. How much do you have to pay if you are late in your repayments?

$$25\% \text{ of } 300 = 25\% \times 300$$

$$= \$75$$

\$75 is more than \$68, you will pay \$68 since the policy is to pay whatever is less.

Key ideas

1. When borrowing money, a repayment plan is required, otherwise the amount you owe will keep due to interest.
2. Some businesses offer buying on terms, where you pay over a period of time if you cannot afford something upfront.
3. Some businesses offer "buy now pay later," which is interest-free, but has large for being late.

Read AfterPay's information and answer the questions.

When you use Afterpay, you pay for your items in 4 equal instalments over 6 weeks, without incurring any interest.

We pay the retailer in full and upfront on your behalf. You pay for the first instalment of 25% at the time of purchase, and the remaining three instalments will be automatically deducted from your nominated debit or credit card due every 2 weeks over the following six weeks.

Total late fees are capped at 25% of the order price, and will never exceed \$68 per order, regardless of the order amount.

- For each order of \$40 or below, the total Late Fee payable is one Late Fee capped at 25% of the Original Order Value. The maximum possible late fee is \$10 and will only be charged once.

For example:

A \$20 order with four \$5 instalments will only ever incur a one-off \$5 late fee.

- For each order above \$40, the total amount of Late Fees payable is the lower of 25% of the Original Order Value or \$68. Up to this maximum Late Fee cap, we will charge an initial Late Fee of \$10, and a further Late Fee of \$7 if the payment remains unpaid 7 days after the due date. We may charge partial amounts of the initial \$10 Late Fee and the subsequent \$7 Late Fee to remain within the maximum Late Fee cap.

For example:

A \$60 order with four \$15 instalments will incur an initial \$10 late fee, and a further \$5 if the payment remains unpaid seven days after the due date. In this case, the further fee of \$7 is reduced because total late fees are capped at 25% of the order price, \$15.

We also pause your account until the balance is paid and you're back on track.

1 You use AfterPay to purchase some makeup for \$50.

a How much is each instalment?

\$12.50

b Imagine you miss a payment. What is the late fee?

\$10

c How much will you be charged if you are over a week late in your payment?

only \$2.50 in this scenario.

d What is the maximum amount you can pay in late fees for the makeup?

\$12.50

2 You use AfterPay to purchase an iPad for \$2000.

a How much is each instalment?

\$500

b Imagine you miss a payment. What is the late fee?

\$10

c How much will you be charged if you are over a week late in your payment?

\$7

d What is the maximum amount you can pay in late fees for the iPad?

\$68

3 Read the following information on the advantages and disadvantages of buy now pay later:

The modern shopping landscape has changed drastically over the years, thanks to the emergence of *Buy Now, Pay Later* (BNPL). This payment method allows consumers to acquire goods immediately and defer payment in instalments over time.

One of the advantages of BNPL services is accessibility. These platforms often have more lenient requirements compared to traditional credit options, such as credit cards or personal loans. They typically don't involve credit checks or rigorous approval processes, making them accessible to a broader demographic, including individuals with limited credit history or lower credit scores. This accessibility allows more people to afford goods they might not otherwise be able to acquire upfront.

Moreover, BNPL services provide convenience and flexibility to consumers. They break down the cost of purchases into manageable instalments, easing the burden of larger expenses. This approach enables budget-conscious individuals to spread out payments over time. Additionally, the absence of interest or minimal interest rates during the instalment period makes it an attractive alternative to traditional credit cards.

BNPL services come with their set of drawbacks. One concern is the potential to encourage overspending. The ease of making purchases without immediate consequences might lead consumers to indulge in more significant expenses than they can afford in the long term. This could contribute to a cycle of debt if not managed responsibly, particularly for impulsive buyers.

Another downside is the impact on credit scores and financial health. While BNPL services often don't perform hard credit checks before approving transactions, missed payments could negatively affect credit scores. This might hinder individuals seeking loans or traditional credit in the future, as lenders consider these missed payments when assessing creditworthiness.

a What primary advantage do Buy Now, Pay Later services offer in terms of accessibility?

More lenient approval processes compared to credit cards.

b How do BNPL services ease the burden of larger expenses for consumers?

Breaks down large purchases into smaller parts.

c What potential risk is associated with the convenience of BNPL services?

Encourages overspending.

d How might overspending become an issue with these payment platforms?

Could result in a cycle of debt.

e What impact can missed payments on BNPL instalments have on an individual's financial status?

Negatively affect credit scores, making it harder to get loans from banks.