

Maths in Context: 'Mrs Sim's Dollars and Sense'

*An AMSI Schools ChooseMATHS 'Open Task'
for Students in Years 9 & 10*



Task Booklet

*Many thanks to Mrs Sally Sim from Scone Grammar School (NSW)
for developing, writing and contributing this task.*

Some formulae which may be useful in this task:

Gross Income = Total amount earned (from all sources) before tax

Net Income = Gross Income – Tax

Taxable Income = Gross Income - Deductions

Simple Interest: $I = PRN$ (where I = Total interest earned or paid;

P = Principal amount borrowed or invested;

R = Annual interest rate expressed as a decimal, eg. 8% = '0.08'; and

N = Number of years over which the amount is borrowed or invested.)

also,

$A = P + I$ (where A = Accumulated amount of money paid back or recouped after investment; and

P and I are as above.)

Compound Interest: $A = P(1 + r)^n$

(where A = Accumulated amount of money paid back or recouped after investment;

$r = \frac{\text{annual interest rate}}{\text{periods per year}}$; and

$n = \text{number of compounding periods per year} \times \text{number of years.}$)

Depreciation: $A = P(1 - r)^n$ (see above)

Background

Congratulations! You got the job!

You are working for an employer being paid a set rate of \$ _____ / hour for the first 35 hours each week.

(Select an hourly rate between \$15 and \$25 per hour)

Your award / pay agreement also sets out that you are to be paid 'time-and-a-half' (your pay rate x 1.5) for the first 4 hours you work after 35 hours, and 'double-time' (your pay rate x 2) thereafter.



Part One – How much will you be paid?

1. Calculate *(and show any of your working)*:

a. Your 'time-and-a-half'-rate

1

b. Your 'double-time' rate

1

2. Calculate your gross wage in a week where you work:

a. 35 hours in the week

1

b. 38 hours in the week

2

c. 42 hours in the week

2

3. Presuming you work 35 hours per week for a whole financial year, calculate your **gross income** for that year (assume 1 year = 52 weeks).

2

Part Two – How much will you be taxed?

4. In that same year, you have deductions of \$1,000 for approved charity donations, \$480 for union fees and \$250 for uniforms. Calculate your **taxable income** for the year.

2

5. Using the table below, calculate the **tax payable** on your taxable income.

3

Taxable Income	Tax payable on this Income
0 - \$18 200	Nil
\$18 201 - \$37 000	19c for each \$1 over \$18 200
\$37 001 - \$80 000	\$3 572 plus 32.5c for each \$1 over \$37 000
\$80 001 - \$180 000	\$17 547 plus 37c for each \$1 over \$80 000
\$180 001 and over	\$54 547 plus 45c for each \$1 over \$180 000

Part Three – How much can you save?

7. During the year, you have saved 15% of your gross income.

a. How much is this? Answer correct to the nearest cent.

1

b. At this rate, how many years will it take you to save \$10,000? Round your answer to one decimal place.

2



Part 4 – How much will it cost to borrow?

8. You want to buy a car. The bank says they will lend you up to \$30,000 and will charge you 7% p.a. simple interest over 5 years.
- a. Find a suitable car of your choice in the newspaper or on the internet and paste the advertisement/details (and include a picture!) in the space below. **Make sure you include the price of the car.**

1



Answer the following questions about the purchase of your car:

- b. How much interest will you be paying over the 5 years of your loan?

1

c. What will be the total cost of the car, including the interest?

1

d. If you pay off the car in equal monthly instalments, how much will each repayment be?

2

9. The car depreciates at a rate of 18% per annum.

How much will it be worth when you have finished paying off your loan in 5 years' time?

2

10. Discuss the advantages and disadvantages of taking out a loan to buy a car.

In your answer, consider the amount you have paid for it as well as its value at the end of the loan period.

2

Part 5 – What will you make by investing?

11. A close family member wins Lotto and is kind enough to invest \$ _____ in an account for you which earns 6% p.a. **compound interest**. You can have access to the money and the interest it has earned when you turn 21.

(Select an amount for your investment between \$5 000 and \$20 000)

a. For how many years will the money be invested?

1

b. Calculate the amount to which the money will grow over this time if the interest compounds:

i. annually:

2

ii. monthly:

2

iii. weekly:

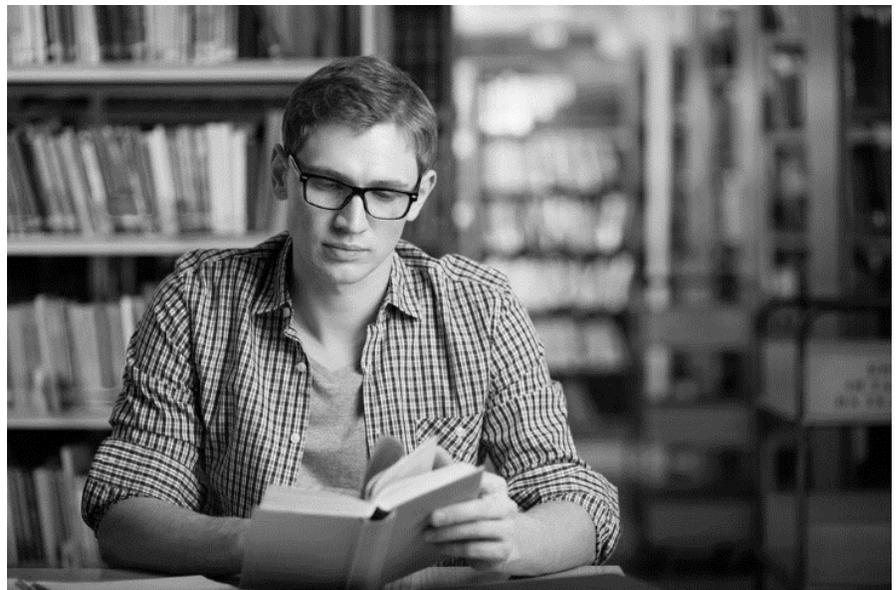
2

c. *How much more interest* would you earn if the money compounded monthly, rather than annually?

1

d. Using your calculations in part (b) above, explain clearly what is meant by the statement, “the more often that interest is paid, the larger the amount to which the principal grows”.

3



NSW Syllabus and Australian Curriculum Outcomes

Financial Mathematics 5.1 (NSW)

A student:

- Uses appropriate terminology, diagrams and symbols in mathematical contexts (MA5.1-1WM);
- Selects and uses appropriate strategies to solve problems (MA5.1-2WM);
- Provides reasoning to support conclusions that are appropriate to the context (MA5.1-3WM); and
- Solves financial problems involving earning, spending and investing money (MA5.1-4NA).

Financial Mathematics 5.2 (NSW)

A student:

- Selects appropriate notations and conventions to communicate mathematical ideas and solutions (MA5.2-1WM);
- Interprets mathematical or real-life situations, systematically applying appropriate strategies to solve problems (MA5.2-2WM); and
- Solves financial problems involving compound interest (MA5.2-4NA).

Australian Curriculum (Mathematics) Outcomes

- Solve problems involving simple interest (ACMNA211); and
- Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229).

Skill elements drawn from the Australian Curriculum (Mathematics) Proficiencies, Levels 9 & 10

- Formulating and modelling practical situations using financial information;
- Finding unknowns in formulas after substitution and comparing simple and compound interest in financial contexts;
- Using a range of strategies to solve equations and using calculations to investigate financial outcomes; and
- Interpreting and evaluating financial media / advertising statements and interpreting and comparing datasets to draw valid conclusions.

Stage 5.1 & 5.2 Marking Rubric

Total marks available = 38

Achievement Grade	Achievement Performance Description
<p style="text-align: center;">A</p> <p style="text-align: center;">(38 – 40 marks)</p>	<ul style="list-style-type: none"> • Accurately and consistently solves financial problems involving earning, spending and investing money, clearly showing valid working; • Accurately and consistently solves financial problems involving compound interest, clearly showing valid working; • Uses valid and appropriate terminology, diagrams and symbols in financial mathematical contexts; • Selects appropriate financial notations and conventions to clearly communicate mathematical ideas; • Interprets mathematical or real-life situations, systematically selecting appropriate strategies to solve problems; • Correctly applies appropriate and efficient strategies to solve financial problems; and • Provides sound and valid mathematical reasoning to support conclusions that are appropriate to the financial context.
<p style="text-align: center;">B</p> <p style="text-align: center;">(32 – 37 marks)</p>	<ul style="list-style-type: none"> • Solves financial problems involving earning, spending and investing money with a high degree of accuracy, showing valid working; • Solves financial problems involving compound interest with a high degree, showing valid working; • Uses valid terminology, diagrams and symbols in financial mathematical contexts; • Selects appropriate financial notations and conventions to communicate mathematical ideas; • Interprets mathematical or real-life situations, selecting valid strategies to solve problems; • Applies appropriate strategies to solve financial problems; and • Provides sound mathematical reasoning to support conclusions that are appropriate to the financial context.
<p style="text-align: center;">C</p> <p style="text-align: center;">(25 – 31 marks)</p>	<ul style="list-style-type: none"> • Solves financial problems involving earning, spending and investing money with reasonable accuracy, showing working; • Solves financial problems involving compound interest with reasonable, showing working; • Uses sound terminology, diagrams and symbols in financial mathematical contexts; • Selects valid financial notations and conventions to communicate mathematical ideas; • Interprets mathematical or real-life situations, selecting strategies to solve some problems; • Applies selected strategies to solve some financial problems; and • Provides limited mathematical reasoning to support conclusions that are appropriate to the financial context.
<p style="text-align: center;">D</p> <p style="text-align: center;">(15 – 24 marks)</p>	<ul style="list-style-type: none"> • Solves financial problems involving earning, spending and investing money with a fair degree of accuracy, showing limited working; • Solves financial problems involving compound interest with a fair degree of accuracy, showing limited working; • Uses limited terminology, diagrams or symbols in financial mathematical contexts; • Uses limited financial notation or and conventions to communicate mathematical ideas; • Demonstrates partial understanding of mathematical or real-life situations, selecting limited or inefficient strategies to solve some problems; • Applies selected strategies to solve some financial problems with limited accuracy; and • Fails to use mathematical reasoning to support drawn conclusions.
<p style="text-align: center;">E</p> <p style="text-align: center;">(< 15 marks)</p>	<ul style="list-style-type: none"> • Demonstrates incomplete or inaccurate solutions to financial problems involving earning, spending and investing money; • Demonstrates incomplete or inaccurate solutions to financial problems involving compound interest; • Uses incorrect terminology, diagrams or symbols in financial mathematical contexts; • Uses incorrect financial notation or and conventions; • Demonstrates poor understanding of mathematical or real-life situations and/or fails to select any valid strategy to attempt to solve financial problems; • Fails to use mathematical reasoning to support drawn conclusions.