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| Name: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |  |
| Baldivis logo cropped | **Mathematics Applications Unit 3 & 4 Year 12**  **Investigation 3, 2020**  **Topic – Finance** | | | |  |
| **Equipment:** | *SCSA Formula sheets, CAS calculator* | | | | |
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| **Date out:** | | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_* | **Date Due:** | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_* | |
| **Task Weighting:** | | *7% of the year* |  |  | |

**Important Information**

Valerie has been working for 10 years in Western Australia in hospitality and as a wellness lifestyle coach. She has saved $35,000 in this time. Valerie has decided to spend next year travelling. Obviously, she won’t be able to travel around the world in 2021 as there is no end in sight to the COVID-19 global pandemic. Instead, Valerie will be travelling around Australia in a van.

Valerie has come across Comfortably Lost’s blog post at <https://comfortablylost.com/vanlife-in-australia-is-it-financially-sustainable/> about the upfront costs and living costs and needs your assistance to do the mathematics of whether it is possible. Valerie is prepared to work while she travels around Australia using her hospitality skills in waitressing and working in bars. She wants the van set up as mentioned on Comfortably Lost’s blog post as well as a home office set up so that she can keep in contact with loved ones and maintain contact with her wellness lifestyle clients.

As Valerie does not have a thorough understanding of finances you will also need to develop a system that she will be able to use for tracking expenses and save $300 per month.

**Writing up your work**

The format of an investigation report may be written or multimodal. The report should be a maximum of six pages, (including graphs), if written, or the equivalent in multimodal form. Your findings need to be supported with evidence of mathematical analysis.

SCSA dot points and grade descriptions have been provided to give you information on what to include in your report in order to maximise your achievement.

### Topic 4.2: Loans, investments and annuities (20 hours)

**Compound interest loans and investments**

4.2.1 use a recurrence relation to model a compound interest loan or investment and investigate (numerically or graphically) the effect of the interest rate and the number of compounding periods on the future value of the loan or investment

4.2.2 calculate the effective annual rate of interest and use the results to compare investment returns and cost of loans when interest is paid or charged daily, monthly, quarterly or six-monthly

4.2.3 with the aid of a calculator or computer-based financial software, solve problems involving compound interest loans, investments and depreciating assets

**Reducing balance loans (compound interest loans with periodic repayments)**

4.2.4 use a recurrence relation to model a reducing balance loan and investigate (numerically or graphically) the effect of the interest rate and repayment amount on the time taken to repay the loan

4.2.5 with the aid of a financial calculator or computer-based financial software, solve problems involving reducing balance loans

**Annuities and perpetuities (compound interest investments with periodic payments made from the investment)**

4.2.6 use a recurrence relation to model an annuity, and investigate (numerically or graphically) the effect of the amount invested, the interest rate, and the payment amount on the duration of the annuity

4.2.7 with the aid of a financial calculator or computer-based financial software, solve problems involving annuities (including perpetuities as a special case)

**SCSA Grade Descriptors**

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| **A** | **Identifies and organises relevant information**  Identifies and organises relevant information for complex problems involving a series of steps or processes.  Defines variables from text to draw networks and diagrams.  Organises data in a concise, clear format and appropriately presents it in tabular, diagrammatic and/or graphical form.  Identifies the underlying assumptions related to the relevant mathematics of an investigation. |
| **Chooses effective models and methods and carries through the methods correctly**  Accurately applies mathematical knowledge and understanding to solve unstructured problems using sub-problems.  Generalises and extends models from previous parts of the question.  Translates between representations in unpractised ways.  Selects appropriate calculator techniques to solve multi-step problems in unfamiliar contexts.  Selects and appropriately uses numerical, graphical, symbolic and statistical methods to develop mathematical ideas.  Produces results, carries out analysis and generalises in situations requiring investigative techniques. |
| **Follows mathematical conventions and attends to accuracy**  Follows mathematical conventions and attends to accuracy in non-routine situations.  Provides concise and accurate solutions to mathematical problems set in applied and theoretical contexts.  Selects, extends and applies mathematical and/or statistical procedures to investigate a problem. |
| **Links mathematical results to data and contexts to reach reasonable conclusions**  Recognises implied conditions in real-life applications and defines and explains the limitations of models.  Interprets the result and draws the correct conclusion about the effect of changing conditions.  Considers the strengths and limitations of an investigation and refines the results to make sensible conclusions. |
| **Communicates mathematical reasoning, results and conclusions**  Sets out the steps of the solution in a clear and logical sequence, including suitable justification and explanation of methods and processes used.  Adds a detailed diagram to illustrate and use in the solution of a problem.  Presents work with the final answer clearly identified, using the correct units and relating to the context of the question.  Communicates investigation findings with a comprehensive interpretation of mathematical results in the context of the investigation. |

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| **B** | **Identifies and organises relevant information**  Identifies and organises relevant information for problems involving a few steps or processes.  Draws a network or diagram and labels with appropriate variables.  Organises data clearly and appropriately presents it in tabular, diagrammatic and/or graphical form.  Identifies suitable variables and constant parameters related to various aspects of an investigation. |
| **Chooses effective models and methods and carries through the methods correctly**  Selects an appropriate strategy and applies mathematical knowledge to solve problems that contain a few steps.  Translates between representations in practised ways.  Selects appropriate calculator techniques to solve multi-step problems.  Selects and appropriately uses numerical, graphical, symbolic and statistical methods to develop mathematical ideas.  Attempts to analyse and calculate specific cases of generalisation in situations requiring investigative techniques. |
| **Follows mathematical conventions and attends to accuracy**  Interprets and uses mathematical terminology, symbols and conventions in routine situations.  Rounds, unprompted, to suit context or correctly to specified accuracy.  Completes mostly accurate solutions to mathematical problems set in applied and theoretical contexts.  Selects and applies mathematical and/or statistical procedures previously learnt to investigate a problem. |
| **Links mathematical results to data and contexts to reach reasonable conclusions**  Identifies specified conditions in real-life applications, recognises and rejects inappropriate solutions.  Links the effect of changing conditions to the original solution.  Uses examples in mathematical analysis of an investigation and draws valid conclusions related to a given context. |
| **Communicates mathematical reasoning, results and conclusions**  Carries through calculations and simplifications in a clear sequence, showing a logical line of reasoning.  Defines variables associated with a given diagram and uses them in the working of a problem.  Presents work with the final answer clearly identified and using the correct units.  Communicates investigation findings in a systematic and concise way using mathematical language and relating the solution to the original problem or statement. |

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| **C** | **Identifies and organises relevant information**  Identifies and extracts key information needed to solve a familiar problem.  Identifies variables in a network or diagram.  Organises some data and presents it in tabular, diagrammatic and/or graphical form.  Identifies some mathematical content related to various aspects of an investigation in a given context. |
| **Chooses effective models and methods and carries through the methods correctly**  Selects a strategy and applies mathematical knowledge to answer structured questions that require short responses.  Recognises and uses information in different representations.  Uses familiar calculator applications to solve routine problems.  Selects appropriate numerical, graphical, symbolic and statistical methods to carry through a single thread of reasoning in situations requiring investigative techniques. |
| **Follows mathematical conventions and attends to accuracy**  Applies mathematical definitions, rules and procedures in practised situations.  Applies basic conventions for diagrams and graphs.  Rounds appropriately in a given context and to specified accuracy in short responses.  Generates some accurate and generally complete solutions to mathematical problems set in applied and theoretical contexts.  Selects and applies, with direction, mathematical and/or statistical procedures previously learnt to investigate a problem. |
| **Links mathematical results to data and contexts to reach reasonable conclusions**  Identifies specified conditions in real-life applications and recognises inappropriate solutions in routine problems.  Recognises that changing conditions will affect the outcome.  Makes inferences from analysis and uses these to draw conclusions related to an investigation. |
| **Communicates mathematical reasoning, results and conclusions**  Shows adequate working and supports answers with simple or routine statements.  Relates the working to a labelled diagram that has been given as part of the question.  Presents a solution but the final answer is not always clearly identified.  Communicates investigation findings in a systematic way using some mathematical expression and everyday language. |