Maths
A resource for teaching and learning numeracy
consumer.vic.gov.au

• Supports VELS
• Supports VCAL
A resource for the teaching and learning of Maths and Numeracy

Maths
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Acknowledgements
Consumer Affairs Victoria gratefully acknowledges the following teachers:

- Lisa Hayman, Bendigo Secondary College
- Sally Sanderson, Frankston Secondary College
- Geoff Warwick, Maribyrnong Secondary College
- Richard Girvan, Methodist Ladies College
- Manfred Pietrella, Mount Waverley Secondary College
- Alex Zenalides, Northland Secondary College
- John Indian, Sebastopol Secondary College
- Jane Morcom, Xavier College

- Consumer Affairs Victoria gratefully acknowledges the following students: Daniel Bypost, Sharna Conway, David Sezonenko, Jessica-Fern Wirski, Lauren Caldwell, Jessica Tucker, Scott Duncan, Scott Bourne, Joel Ganino, Adrian Palone, Scott Hagley, Skye Milburn, Desiree Lord, Stacey McGregor, Dwayne Jackson and Michael Hodges.

- Consumer Affairs Victoria gratefully acknowledges the following reference group members:
  - Maxine Crapper, Mt. Eliza Secondary College
  - Sally Davis, The Mac.Robertson Girls’ High School
  - Dianne Fabuyanic, Taylors College
  - Odette Kerr, Student teacher, University High School
  - Krishn Lal, Lyndale Secondary College
  - Angela Molloy, Golden Square Secondary College
  - Neil Mitchell, Kealba College
  - Terry O’Brien, Mount Clear College
  - Ian Outhred, Traralgon Secondary College
  - Lorraine Schwartz, Mount Scopus Memorial College
  - Margaret Sinclair, Northcote High School
  - Lexie Walker, University High School

Community Support Fund
This resource has been produced with the support of the Victorian Government through the Community Support Fund
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Introduction to Maths – New Edition

In 2004, Consumer Affairs Victoria launched its Consumer Education in Schools program with resource books for teachers of Years 7 – 12 Commerce, English and Mathematics, as well as a website and a Consumer Stuff Challenge competition. In 2005, two new cross-curricula resources were added, Health & Wellbeing and Consuming Planet Earth. In 2007 a resource focusing on VCAL, The Applied Learning Handbook was added. In 2008, the upper primary resource, Consumer Stuff For Kids, was produced, and it was followed in 2009 by Responsible Gambling and the DVD, Consuming Clips. The Mathematics resource has now been updated to include current effective classroom learning styles, including applied learning and enquiry based learning. This resource, Maths: A resource for the teaching and learning of maths and numeracy, is the result of that update.

The aim of each Consumer Stuff resource is to encourage young people to develop the knowledge, skills and behaviours to make informed decisions as they deal with consumer protection and money management issues. Designed to reflect current thinking on teaching and learning, teachers may find relevant activities in more than one resource book. For instance, activities relating to planning a budget and setting goals can be found in the Mathematics, English, Commerce and Health & Wellbeing resources. Similarly, the influence of print and electronic advertising on consumer spending can be found in the English, Commerce, Health & Wellbeing and Consuming Planet Earth resources.

Teaching mathematics to young people

In teaching mathematics or numeracy to young people there is the opportunity to use issues of relevance to give meaning to mathematics and to help students understand that mathematics is an important and valuable tool (the knowledge and skills) which can be used efficiently and critically. Consumer and financial issues provide rich opportunities for mathematical skill development to occur within a social context and for a social purpose.

For many young people, mathematical skills and knowledge are best developed when applied to real life contexts. In the activities developed in this resource, a range of teaching and learning strategies are included. These include:

- use of small group and whole group activities
- undertaking out-of-class activities or investigations
- use of a variety of relevant and practical classroom based activities, investigations, problem solving, etc.
- use of the internet to find out about mathematics topics or to find data to analyse etc.
- use of oral presentations
- listening to guest speakers
- production of reports, timelines, posters, flowcharts, graphs, etc.
- production of multimedia and/or www reports or documents
- undertaking research projects and investigations

The Sections

This Mathematics resource contains a series of applied learning, practical activities, investigations and lessons suitable for secondary school students, including VCE and VCAL classes. Each of the sections addresses particular consumer and financial issues that affect young people today.

SECTION A: Maths in your life

This introductory section has a range of suggestions for explicit, applied learning maths activities based on the rich information and ideas in the other existing Consumer Stuff resources:

- Commerce
- Consuming Planet Earth
- Health & Wellbeing
- Responsible Gambling.

This enables not only a wide range of maths content areas to be addressed, but also supports activities to be integrated across different curriculum areas.
SECTION B. Shopping around
- purchasing goods
- value for your money
- buying on terms, value for money
- the bottom line

SECTION C. Balancing your income and expenses - Budgeting
- income (wages, tax and more)
- expenses (what students spend their money on)
- budgeting.

SECTION D. Paying bills
- everyday bills
- phones
- internet access
- downloads

SECTION E. Youth Credit and Debt
- young people’s debts
- use of credit cards
- interest calculations
- investigations related to buying and running a car

SECTION F. Measurement and packaging
- packaging
- what you get for your money (weight vs. volume).

SECTION G. Responsible gambling
- probability
- chance
- gambling odds

Answers

Additional Resources

Structure

Each section is comprised of aims and overviews, and outlines the key maths concepts and learning outcomes being targeted. Links to other Consumer Stuff resources, lists of other useful resources, background information and a range of activities and worksheets are included. Finally, there are ideas for potential extensions and further applications.

Visiting speakers

Consumer Affairs Victoria may be able, as part of an ongoing program in your school, to provide a consumer advisor to speak to student groups. Your school would need to integrate the role of the speaker into your teaching and learning activities. For more information, call 1300 55 81 81

Alternatively, invite a young person who has had independent living experience, such as sharing a rented home, buying a car, and managing credit, to speak to the class. Gamblers Help Services may also be able to provide a community educator to speak to your students. For more information, contact your local service via Gamblers Help Line on 1800 858 858.

Additional resources

A list of recommended websites, publications and other resource material is included for teacher reference in the Additional Resources Section.
The Victorian Essential Learning Standards are structured around the knowledge, skills and behaviour all students from P-10 should acquire in three core, interrelated strands of essential learning: Physical and Social Learning; Discipline-based Learning; and Interdisciplinary Learning. These three components are viewed as essential to prepare students for a rapidly changing and globalised world in which they have the capacity to:

- manage themselves as individuals and in relation to others
- manage the world in which they live, and
- act effectively in that world.

The Learning Standards require an interwoven, whole school approach to curriculum planning across the three strands of essential learning and this is reflected in all Consumer Stuff resources.

The activities in this Maths resource include investigations and discussion questions that promote learning in the VELS domains beyond discipline-based learning.

‘Research suggests that students develop deeper understanding of disciplined-based concepts when they are encouraged to reflect on their own learning, take personal responsibility for it and relate it to their own world. These approaches are explicitly defined in the Physical, Personal and Social Learning domains such as physical education and personal learning.

Students are better able to develop, demonstrate and use discipline-based knowledge and skills when they are able to employ knowledge in Interdisciplinary Learning such as Communication; Thinking; Information and Communications Technology; Design, Creativity and Technology.’


The curriculum mapping of the student worksheets on page 7 demonstrates how the worksheet activities and the many extension tasks have been designed to reflect the three strands of essential learning, particularly for years 9 and 10.
### Links to Victorian Essential Learning Standards (VELS)

<table>
<thead>
<tr>
<th>STRAND</th>
<th>DOMAIN</th>
<th>DIMENSION</th>
<th>Worksheets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical, Personal and Social Learning</strong></td>
<td><strong>Health and Physical Education</strong></td>
<td>Movement and physical activity</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Health knowledge and promotion</td>
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<td></td>
<td><strong>Interpersonal Development</strong></td>
<td>Building social relationships</td>
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<tr>
<td></td>
<td></td>
<td>Working in teams</td>
<td>C1, C4, D4-5, F1-4, G1-5</td>
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<tr>
<td></td>
<td><strong>Personal learning</strong></td>
<td>The individual learner</td>
<td>F1-5, G1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Managing personal learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Civics and Citizenship</strong></td>
<td>Civic knowledge and understanding</td>
<td>C1-6, D1-6, E1-5, G1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community engagement</td>
<td></td>
</tr>
<tr>
<td><strong>Discipline-based Learning</strong></td>
<td><strong>English</strong></td>
<td>Reading</td>
<td>C1-6, D1-4, E1-5, F5, G1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Writing</td>
<td>F1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speaking and listening</td>
<td>D4-5, E1-5, F1-4, G1-5</td>
</tr>
<tr>
<td></td>
<td><strong>Humanities (Economics)</strong></td>
<td>Economic knowledge and understanding</td>
<td>B1-4, C1-5, F1-4, D1-4, E5-5, F1-4, G1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic reasoning and interpretation</td>
<td>B1-4, C1-6, D1-4, E1-5, F1-4, G1-5</td>
</tr>
<tr>
<td></td>
<td><strong>Mathematics</strong></td>
<td>Number</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Space</td>
<td>F1-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement, chance and data</td>
<td>D4-6, F1-5, G1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structure</td>
<td>E4, F2-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working mathematically</td>
<td>All</td>
</tr>
<tr>
<td><strong>Interdisciplinary based learning</strong></td>
<td><strong>Communications</strong></td>
<td>Listening viewing and responding</td>
<td>B1-4, D4-5, E1-5, F1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presenting</td>
<td>D4-5, E1-5, F1-4</td>
</tr>
<tr>
<td></td>
<td><strong>Information Communications Technology (ICT)</strong></td>
<td>ICT for visualizing thinking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ICT for creating</td>
<td>C5, D4-5, E4, F1-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ICT for communicating</td>
<td>D4-6, E4, F1-4</td>
</tr>
<tr>
<td></td>
<td><strong>Thinking</strong></td>
<td>Reasoning, processing and inquiry</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creativity</td>
<td>F1-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflection, evaluation and metacognition</td>
<td>All</td>
</tr>
</tbody>
</table>

Note: Where there is no activity in a particular Domain e.g. Humanities (History), then that Domain and its associated Dimensions, have not been included in the above grid.
## Links to Victorian Certificate of Applied Learning (VCAL)

<table>
<thead>
<tr>
<th>NUMERACY</th>
<th>Worksheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numeracy for Practical Purposes</td>
<td>D5, F1-4</td>
</tr>
<tr>
<td>Numeracy for Interpreting Society</td>
<td>B1-4, C1-4, D1-4, E1-5, F1-4, G1-5</td>
</tr>
<tr>
<td>Numeracy for Personal Organisation</td>
<td>B1-4, C1-4, D1-4, E1-5, F1-4, G1-5</td>
</tr>
<tr>
<td>Numeracy for Knowledge</td>
<td>E4, F1-4</td>
</tr>
<tr>
<td>PERSONAL DEVELOPMENT SKILLS</td>
<td>C1-6, D4-5, E1-5, F1-4, G1-5</td>
</tr>
</tbody>
</table>

Notes:

1. The activities align to the learning outcomes listed but may not cover all the assessment criteria. Please check the relevant Curriculum Planning Guide to ensure all assessment criteria are covered.

2. The VCAL level is not named for each Unit or worksheet. Most can be modified for use at the different VCAL levels from Foundation through to Senior, with a major difference being the level and amount of assistance, support and guidance given to the learner.
# The Thinking Curriculum

<table>
<thead>
<tr>
<th>Multiple intelligences</th>
<th>Consumer education activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verbal/linguistic</strong></td>
<td>Letter writing, word searches, debates, role plays, interviews with consumers and traders, interpreting energy rating labels, utility statements and analysing advertising techniques.</td>
</tr>
<tr>
<td><strong>Logical/mathematical</strong></td>
<td>Problem-solving, surveys, analysing and interpreting statistics eg. calculating the running costs of household appliances and utilities.</td>
</tr>
<tr>
<td><strong>Visual/spatial</strong></td>
<td>Maps, cartoons, board games, graphs, and the design of website material and spreadsheets, posters and packaging material.</td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td>Co-operative group work, discussions, interviews, group investigations and consumer awareness campaigns.</td>
</tr>
<tr>
<td><strong>Intrapersonal intelligence</strong></td>
<td>Reflective journals, self-assessment and setting personal goals.</td>
</tr>
<tr>
<td><strong>Bodily/kinaesthetic</strong></td>
<td>Role plays, excursions to markets and shopping centres to better understand consumers and traders.</td>
</tr>
<tr>
<td><strong>Musical/rhythmic</strong></td>
<td>Writing songs and jingles on consumer themes.</td>
</tr>
<tr>
<td><strong>Naturalist</strong></td>
<td>Conducting experiments and investigations, eg. how to reduce energy and water bills.</td>
</tr>
</tbody>
</table>

## Thinking skills

As well as knowledge about their rights and responsibilities, consumers also need the skills to think critically and creatively.

Creative thinking techniques have been used where possible to develop students' lateral and 'deep' thinking skills, for instance, Six Thinking Hats developed by Dr Edward De Bono:

- **Red Hat** for feelings intuition and emotions
- **White Hat** for information
- **Green Hat** for creative thinking
- **Black Hat** for critical thinking
- **Yellow Hat** for positive thinking
- **Blue Hat** for ‘thinking about thinking’ ie working out the order of the 'Hats' and deciding what other thinking techniques to use.

## Emotional intelligence

The value of teaching emotional intelligence is also recognised and incorporated into a number of activities eg. discussions about consumerism, stereotyping and the influence of advertising.

Dr Daniel Goleman's Emotional Intelligence identified key elements associated with emotional intelligence:

<table>
<thead>
<tr>
<th>Self awareness</th>
<th>Recognising personal strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-regulation</td>
<td>The ability to control impulses and accept responsibility for one's own actions</td>
</tr>
<tr>
<td>Motivation</td>
<td>This includes having commitment and drive</td>
</tr>
<tr>
<td>Empathy</td>
<td>The ability to understand other people’s feelings and point of view</td>
</tr>
<tr>
<td>Social skills</td>
<td>This includes the ability to co-operate with others and communicate effectively</td>
</tr>
</tbody>
</table>

Group work, roleplays and reflective journals are just some of the activities designed to improve these skills.
Maths in your life - Introduction

Mathematics teachers will find this Consumer Stuff resource useful and relevant to mathematics teaching. However, there is also a wide range of rich mathematics teaching and learning ideas in each of the titles in the Consumer Stuff series.

This introductory section sets out a range of suggestions for practical and relevant maths activities based on these four Consumer Stuff resources:

- Commerce
- Consuming Planet Earth
- Health & Wellbeing
- Responsible Gambling

The Commerce book addresses issues such as how to make consumer choices, going shopping, consumer rights and responsibilities, managing your money, and the global consumer. The Consuming Planet Earth resource looks at environmental and sustainability issues, including buying ‘green’, the real cost of food, smarter transport options, and the consuming culture.

The material in Health & Well-Being addresses values associated with issues such as making healthy food choices, body image, reasons and motivations for shopping and responsible gambling. The most recent resource, Responsible Gambling, aims to help young people build resilience and feelings of self-worth, as well as developing responsible behaviours and attitudes.

The existing information, activities and worksheets in the above four resources enable not only a wide range of maths content areas to be addressed, but also support teaching activities to be integrated across different curriculum areas. The activities in these resources are embedded within contexts of interest, relevance and importance to young people and as such provide excellent opportunities for mathematics students to see how mathematics can be used and applied in a wide range of situations and contexts. Mathematics is a vital tool that they need in their lives outside of the maths classroom.

Each of the relevant activities from the four Consumer Stuff resources are listed in the tables on the following pages against the four maths areas of number, statistics, probability and measurement and geometry.

The materials can be used in a number of ways:

- as stand alone activities or worksheets to support other teaching in these content areas; or
- as supplementary support materials and extra information or practice for the material within this resource; or
- as potential assessment tasks.

The Consumer Stuff teacher resources can be viewed, downloaded and/or ordered from www.consumer.vic.gov.au/consumerstuff/Resources for secondary teachers. Hard copies can also be ordered by email: consumerstuff@justice.vic.gov.au
# Number

<table>
<thead>
<tr>
<th>Book, worksheet and description</th>
<th>Links to this book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMERCE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A3: Let’s go shopping! — p. 18</strong></td>
<td></td>
</tr>
<tr>
<td>Investigate buying a mobile phone and mobile phone plans. Possible maths activities include:</td>
<td>SECTION B. Shopping around:</td>
</tr>
<tr>
<td>• Extending the “Finding the best deal” activity to researching and comparing a mobile phone purchase from two different companies. This would provide a range of opportunities to undertake numerical calculations and to present student’s findings in a report</td>
<td>• Value for your money</td>
</tr>
<tr>
<td>• Buying on terms</td>
<td></td>
</tr>
<tr>
<td><strong>E2: What am I worth? (in dollars and cents!) — p. 66</strong></td>
<td>SECTION C. Balancing your income and expenses - Budgeting:</td>
</tr>
<tr>
<td>Work out students’ goals and planning for their financial future.</td>
<td>• Assets and liabilities.</td>
</tr>
<tr>
<td><strong>E3: Cash flow statements and budgets — pp. 67-70</strong></td>
<td>SECTION C. Balancing your income and expenses - Budgeting:</td>
</tr>
<tr>
<td>This activity is full of mathematics related to budgeting and explicitly supports the activities in Section B of this Maths book. This activity is about supporting students to understand where their money goes and how budgets help them do that.</td>
<td>• Income – wages, tax and more</td>
</tr>
<tr>
<td>• Expenses – what do you spend your money on</td>
<td></td>
</tr>
<tr>
<td>• Budgeting for an event</td>
<td></td>
</tr>
<tr>
<td>• Your budget.</td>
<td><strong>SECTION E.</strong> Credit and loans:</td>
</tr>
<tr>
<td><strong>E4: Paying off the card — p. 71</strong></td>
<td>SECTION B. Shopping around:</td>
</tr>
<tr>
<td>Paying off the card looks at paying off credit card debt and how long it takes if you pay only the minimum balance each month. It relates explicitly to a number of sections in this resource, and can be used as supplementary material.</td>
<td>• Buying on terms</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION E.</strong> Credit and loans:</td>
</tr>
<tr>
<td></td>
<td>• Debts</td>
</tr>
<tr>
<td></td>
<td>• Credit cards</td>
</tr>
<tr>
<td></td>
<td>• Interest calculations.</td>
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### Number

| E5: Mobile phone debt — pp. 72-73 |
| E6: Case studies — pp. 74-75 |
| E: Extensions/revision — pp. 76-77 |

Telephone bills cause financial difficulties for more than a third of young consumers seeking help from financial counsellors. Significant mobile phone debts affect many young people.

When paying for goods and services, consumers have many choices. There is a growing use of plastic cards (debit and credit), ATM machines, EFTPOS, phone and internet banking.

Both of these activities and the extension and revision suggestions relate directly to a number of sections in this resource, and can be used as valuable extra information about the dangers of credit card debt. Some of the activities are also useful to support the teaching and learning of the maths related to paying bills and using credit cards and other payment and borrowing methods.

### CONSUMING PLANET EARTH

| B1: Calculating utility costs — p. 34 |
| B4: Making sense of energy rating labels — pp. 39-42 |

Students are asked to collect information about their utility use and costs from home and then work out per head costs and undertake some comparisons etc.

Many of our every day appliances now have energy, environmental and water ratings on them to help consumers make informed decisions. Saving energy can be good for the wallet as well as the planet.

This worksheet gets students to investigate and analyse energy rating labels for different types of appliances. Full of hands on activities and maths!
**Number**

### B5: How sustainable is my home? — pp. 43-44

From July 2004 every new home and apartment in Victoria has needed to have a 5 star level of energy efficiency. There are different ways of achieving the rating.

A worksheet based investigation that allows students to look at how they can undertake an audit to investigate the sustainability of their own home.

Not covered in the Maths resource – can be used independently.

### C: The real cost of food

**C1: My food footprint — pp. 48-52**

The introduction to the section *The real cost of food* and the first part of C1 on food footprints provide information and activities about the production costs of different food products. They take into account the costs of importing goods from overseas.

The introduction and activity cover a range of maths skills in number, statistics and measurement.

An easy addition/extension would be to get students to undertake the activity of working out how many fresh oranges it would take for them to get a 1 or 2 litre container of orange juice and compare and discuss the results of the activity.

### C3: Water – tap or bottle? — p. 54

A worksheet that compares the cost of tap water with the cost of bottled spring water.

### SECTION B.

**Shopping around.**

### D1: Getting around — pp. 63-64

**D2: The real cost of a car — p. 65**

**D3: Consuming fuel — p. 66**

This section and the separate activities look at the issues related to using public transport versus travelling by car, including looking at environmental issues.

There is a rich amount of mathematics integrated into the activities including undertaking surveys of transport usage and analysing the costs of running a car.

### SECTION F.

**Measurement and labelling of goods.**

### SECTION E.

Credit and loans:

- Buying and running a car.
# Number

## HEALTH & WELLBEING

### A2: Making healthy food choices! — pp. 16-17

A worksheet that analyses a report on chips and healthy diets — full of numbers and statistics.

Could be used as the basis for undertaking a classroom or school survey about eating habits and preferences.

Not covered in the Maths resource – can be used independently.

### B3: Want it...need it...must have it? — pp. 30-31
### B4: Independent shopping — pp. 32-35

A number of activities relate to buying goods and paying for them, including via credit cards. They also have helpful tips and suggestions to help students stretch their food dollar further.

It is full of maths activities and worksheets that support many of the activities in this maths resource.

SECTION C. Balancing your income and expenses – Budgeting
SECTION B. Shopping around.
SECTION D. Paying bills.
SECTION E. Credit and loans.

### B7: What should the label say? — pp. 39-41
### B8: Labelling for life! — pp. 42-45

These activities and investigations look at the range of nutritional information on food products especially in relation to following a healthy diet. They analyse the food labelling requirements of the Australia New Zealand Food Standards Code.

There are a range of maths related tasks which can be used and extended to the areas of number, statistics and measurement.

SECTION B. Shopping around.
SECTION D. Paying bills
SECTION F. Measurement and labelling of goods
## Statistics

<table>
<thead>
<tr>
<th>Book, worksheet and description</th>
<th>Links to this book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMERCE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A5: Only one planet Earth — pp. 24-25</strong></td>
<td>Not covered in the Maths resource – can be used independently or linked to issues such as mobile phone purchases in Section B.</td>
</tr>
</tbody>
</table>
| Pressure on the Earth’s scarce resources has led to many environmental problems and this worksheet has three exercises related to this issue:  
  • Create a landfill in the classroom  
  • My life as a mobile phone  
  • Mobile phone survey  
| Possible maths activities include:  
  • *Create a landfill in the classroom* has the potential to provide a valuable classifying and sorting activity. Students could then organise the data collected into a statistical and graphical representation and report about the types of discarded household items. This could also include a measuring activity – to weigh what has been collected as one of the criteria to investigate.  
  • *My life as a mobile phone* again provides an opportunity for students to research and gather data and analyse and report against what they find out.  
  • The third activity, *Mobile phone survey*, is another opportunity to use data collection and analysis skills. |
| **B2: The chocolate market — pp. 31-32** | Not covered in the Maths resource – can be used independently. |
| An activity based around students starting a small business selling chocolates at school. They want to produce small gift boxes that students can give as birthday presents. Students conduct a market survey amongst their friends and other students and find the demand varies depending on the possible prices. This is an excellent graphing opportunity, not only in terms of plotting data, but in terms of interpreting the resulting graphs. |
### Statistics

#### C8: Ad watch — p. 49

This activity is an investigation into advertising, and is based on collecting data about advertising in different types of media – the TV, newspapers, billboards etc.

Possible maths activities include:
- A great chance to get students to collect the different types of data in small groups and then to report to the whole group about their findings. A good opportunity to use spreadsheets to record and analyse the data.

<table>
<thead>
<tr>
<th>Not covered in the Maths resource – can be used independently.</th>
</tr>
</thead>
</table>

#### G3: Gambling – a leisure market case study — pp. 93-95

Based on data about spending on different forms of gambling, this activity presents the opportunity for further statistical analysis especially in providing practice at plotting the data as graphs to supplement the interpretation of the data.

<table>
<thead>
<tr>
<th>SECTION G. How to lose your money quickly:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The realities and consequences of gambling</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION G. Responsible gambling</th>
</tr>
</thead>
</table>

#### CONSUMING PLANET EARTH

#### A1: World population growth — pp. 17-18

In the last 200 years, technological advances in agriculture and medicine have led to increased birth rates and decreased death rates and the world’s population has grown considerably. This worksheet looks at two key questions: ‘How will the population continue to grow?’, and ‘What population level can the planet sustain?’ (also known as the Earth’s carrying capacity).

The activity requires the data to be graphed and analysed – excellent and relevant practice, especially if the data is entered in a spreadsheet.

<table>
<thead>
<tr>
<th>Not covered in the Maths resource – can be used independently.</th>
</tr>
</thead>
</table>

#### A2: It’s not just numbers — pp. 19-22

The issue of ecological footprints is introduced in this worksheet, and would enable students to learn about this issue from a local and even a personal perspective.

The activity is full of numbers and data and again can be used to supplement other classroom activities in statistics and number.

<table>
<thead>
<tr>
<th>Not covered in the Maths resource – can be used independently.</th>
</tr>
</thead>
</table>
## Statistics

### HEALTH & WELLBEING

<table>
<thead>
<tr>
<th>A2: Making healthy food choices! — pp. 16-17</th>
<th>Not covered in the Maths resource – can be used independently.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A worksheet that analyses a report on chips and healthy diets – full of numbers and statistics.</td>
<td></td>
</tr>
<tr>
<td>Could be used as the basis for undertaking a classroom or school survey about eating habits and preferences.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A6: TV advertising — p. 23</th>
<th>Not covered in the Maths resource – can be used independently.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ads for ice-cream, hamburgers, soft drinks, chocolate and biscuits seem to be very popular, particularly around meal times. This worksheet is about undertaking a survey of TV advertising.</td>
<td></td>
</tr>
</tbody>
</table>

### RESPONSIBLE GAMBLING

<table>
<thead>
<tr>
<th>C2: Building awareness – Who gambles? — pp. 75-79</th>
<th>SECTION G. How to lose your money quickly:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3: What forms of gambling are the most popular? — pp. 81-84</td>
<td>• The realities and consequences of gambling.</td>
</tr>
<tr>
<td>The statistics in C2 and C3 relate to findings from a 2003 longitudinal study into Victorian gambling and attitudes to gambling – 2003 Victorian Longitudinal Community Attitudes Survey (The Centre for Gambling Research, ANU).</td>
<td></td>
</tr>
<tr>
<td>The statistics and the activities provide a rich set of data for students to collate and analyse using a range of statistical skills and knowledge, whilst being useful to alert students to the dangers of gambling.</td>
<td></td>
</tr>
</tbody>
</table>
# Probability

## Book, worksheet and description

<table>
<thead>
<tr>
<th>COMMERCE</th>
<th>Links to this book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G1:</strong> Get rich quick – don’t bet on it — pp. 87-90</td>
<td><strong>SECTION G.</strong> How to lose your money quickly:</td>
</tr>
<tr>
<td><strong>G2:</strong> Living within your means — pp. 91-92</td>
<td>• The realities and consequences of gambling</td>
</tr>
</tbody>
</table>

Problem gambling is addressed in this section of the *Commerce* book, and as such provides very useful material and examples to use to supplement the activities in the two sections in this resource that address the same issue.

## RESPONSIBLE GAMBLING

| **A2:** What are my chances? — pp. 22-27 | **SECTION G.** Responsible gambling: |
| **A3:** Electronic Gaming Machines (EGMs or Pokies) — pp. 28-31 | • Nature of chance |
| **A4:** Scratchies — pp. 32-36 | • Dice and coins |
| **A5:** Lotto — pp. 37-40 | • Money and gambling |
| **A6:** Luck — pp. 41-45 | • Betting on non-random events |
| **B2:** Understanding the odds — pp. 55-59 | • Lotto |
| **B3:** Gambling systems — pp. 60-64 |
| **B4:** Poker — pp. 65-68 |

All of the above worksheets and activities address the issue of gambling and different games of chance. They are either activities that can support and further explain the maths of chance and probability that are in Section G. Responsible gambling of this maths resource, or be potentially used as assessment tasks.

Collectively the above material in RESPONSIBLE GAMBLING and the section in this maths resource, SECTION G. Responsible gambling, constitute a comprehensive coverage of the mathematics of chance and probability.
# Measurement and geometry

<table>
<thead>
<tr>
<th>Book, worksheet and description</th>
<th>Links to this book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMERCE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A5: Only one planet Earth — pp. 24-25</strong></td>
<td><strong>SECTION F. Measurement and labelling of goods:</strong></td>
</tr>
<tr>
<td>As described above, this worksheet has 3 exercises:</td>
<td>• Measurement – what do you get for your money (e.g. weight vs. volume)</td>
</tr>
<tr>
<td>• Create a landfill in the classroom</td>
<td></td>
</tr>
<tr>
<td>• My life as a mobile phone</td>
<td></td>
</tr>
<tr>
<td>• Mobile phone survey</td>
<td></td>
</tr>
<tr>
<td>Possible maths activities about measurement include:</td>
<td></td>
</tr>
<tr>
<td>• Create a landfill in the classroom could include a measuring activity – to weigh what has been collected as one of the criteria to investigate.</td>
<td></td>
</tr>
<tr>
<td><strong>CONSUMING PLANET EARTH</strong></td>
<td></td>
</tr>
<tr>
<td><strong>B3: Reducing the waste — pp. 36-38</strong></td>
<td><strong>Not covered in the Maths resource – it can be used independently.</strong></td>
</tr>
<tr>
<td>This worksheet has a number of activities related to reducing waste and starts with a hands on activity sorting and recording household waste.</td>
<td></td>
</tr>
<tr>
<td><strong>C2: Products have lives too — pp. 53</strong></td>
<td><strong>Not covered in the Maths resource – it can be used independently.</strong></td>
</tr>
<tr>
<td>This worksheet looks at the issue of food products having a life cycle made up of a series of stages, including seeding, plant growth, harvesting, transport, processing, packaging, and consumption.</td>
<td></td>
</tr>
<tr>
<td>Investigates the costs of these life cycles, and involves converting from imperial measure to metric.</td>
<td></td>
</tr>
<tr>
<td><strong>C4: Exploring new options — pp. 55-56</strong></td>
<td><strong>Not covered in the Maths resource – it can be used independently.</strong></td>
</tr>
<tr>
<td>The second activity in this worksheet gets students to create and plot a map of all local food outlets and to analyse their location in terms of the types of outlets (e.g. fast food outlets).</td>
<td></td>
</tr>
</tbody>
</table>
Shopping around - Introduction

Aims and overview

The aim of this section is to teach basic shopping management skills. This involves understanding and using data from labels and sales promotion material in order to master the art of smart, focussed and controlled shopping.

Key concepts

The following concepts are covered:

- Comparisons and base lines
- Standards in units of mass (weight) and capacity (liquid volume): gram (g), kilogram (kg), millilitre (ml), litre (l)
- Unit prices or price rates e.g. dollars per kilogram, cents per 100gm
- Discounts, interest rates and buying on terms
- Ratios of prices, volumes and weights

Learning outcomes

At the end of this unit, students should be able to:

- Use research and estimation to establish if a price/cost is realistic and/or best value
- Use the principles of comparison and base line to smart shop (i.e. to maximise the bottom line and stick to a savings plan)
- Calculate and use unit price to compare product costs
- Calculate totals, differences, ratios/proportions and percentage of mass, capacity or money
- Calculate discounts and sale price after discount.

Links to other Consumer Stuff resources

Commerce Resource – Section E

Useful resources


Please refer to Resources page in Additional Resources.
Useful websites are:

- http://www.consumer.vic.gov.au/ which is the website for Consumer Affairs Victoria
- http://www.consumer.vic.gov.au/consumerstuff which is the Consumer Education in Schools (CEIS) teacher resource site. All the Consumer Stuff series of teacher resource books can be viewed, downloaded and ordered from this site.

Background information

As noted in Section E, young consumers face considerable pressures to consume now, rather than later. Young people have an increasing level of spending power (Refer to Section E Teacher Notes), and there are great challenges in trying to balance image with reality and reason. Smart shopping (i.e. control of impulse and good investigative research before shopping) is the focus of this section.

Activities and worksheets

B1: Smart shopping – Limit it to what you have
B2: Checking labels and dockets – Supermarket shopping
B3: Value for your money – Unit prices
B4: Sales and savings – Discounts and sales
Smart shopping: Limit it to what you have

Aims and overview
The aim of this section is to review and reinforce the concept and reality of the bottom line, and how to apply this learning by keeping out of debt.

Key concepts
• Comparison and base line
• Knowing your financial limits
• Planning daily expenses.

Activity 1: $5 in my pocket
Pose the following situation to your class and ask students to work in pairs to answer the questions.

When you left home this morning, you had $5 in your pocket.

• Think of the items you need to pay for today.
• Write down your list of items.
• Is $5 enough to see me through today?
• How much do you need to see you through today?

Discuss as a group how much $5 is worth these days and how you could prioritise to cope in such a situation.

Activity 2: Limit it to what you have
Ask students to think about, discuss and make a list of actions that can help them to make sure:

• They have enough money for the day’s expenses
• They know how to deal with impulse buying and hard sell marketing
• They know how to protect themselves from sales pressures.
Smart shopping: Limit it to what you have

Activity 3: Calculator as protector of your bottom line

Ask your students to undertake the following task with their calculator so they know how to use the memory keys on their calculators:

- Key in $100 in your calculator in Memory+
- Think of the items you might buy at a supermarket.
- Write down your list of items.
- Every time you calculate the cost of an item key in the answer in Memory –
- After the first 2 items are done press Memory recall.

Ask:

- What does the calculator tell you?
- If you have a savings plan, do you have a limit on what you can spend at the supermarket? How can the Memory function help you stick to your savings plan and protect your savings for that week (i.e. your bottom line stays positive)?

Activity 4: Opportunity Cost

You could play the activity titled “Opportunity Cost” in Unit 4 Money, Money, Money from the CAV primary school resource, Consumer Stuff for Kids. This is a good follow on to the above calculator activity. This free resource is downloadable from www.consumer.vic.gov.au/consumerstuff.
Checking labels and docketts:
Supermarket shopping

Aims and overview

The aim of this section is to review and extend knowledge and understanding related to food labels and pricing. This includes numerical and calculation skills related to dates, prices and quantities, and includes calculating with the GST.

Key concepts

• Extracting relevant maths information from texts relating to shopping.
• Identification of GST payments.
• Comparing and sorting information based on price, volume, weight and dates.

Activity 1: Reading Dockets

Collect a selection of docketts from various types of shops including supermarkets, or ask students to bring some to class. Ask the students to examine some of them and to work out what sort of information is included. You could display a typical docket on the whiteboard or smartboard.

One specific issue to address as a group is the Goods and Services Tax (GST). This tax on a wide range of goods and services was introduced in 2000. Currently it is set at 10%. For a full explanation of the GST, go to the website of the Australian Taxation Office (www.ato.gov.au). You could ask questions such as:

• What items attract GST?
• How do you calculate GST?

The latter issue is worth exploring mathematically as it is always confusing to students, especially when trying to work out the GST breakdown when it is included in the price, as it is supposed to be. You might need to cover this maths explicitly.

An example of a supermarket docket is included below in Sample Worksheet B2. Activity 1: Dockets if you want to use it as a starting point or an exercise. Possible questions are included as well.

Activity 2: Reading labels

Collect a selection of labels from non-packaged goods that need to be weighed and costed such as smallgoods, fruit and vegetables. Ask students to examine them and then put them in order of cost or weight or use by date. You could display one label on the whiteboard or smartboard as you did in the previous activity.

An example of a set of supermarket labels is included below in Sample Worksheet B2. Activity 2: Labels if you want to use it as a starting point or an exercise. Possible questions are included as well.
# Maths and Numeracy

## Section B

### Checking labels and docket: Supermarket shopping

#### Sample Worksheet B2. Activity 1: Dockets

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINDT EXCELLENCE CHO 100GRAM</td>
<td>$3.49</td>
</tr>
<tr>
<td>LINDT GINGER 100GRAM</td>
<td>$3.49</td>
</tr>
<tr>
<td>LINDT BLOCK CHOCOLATE 2FOR $6</td>
<td>-$0.98</td>
</tr>
<tr>
<td>MARCO MEATS MAP PK K PERKG</td>
<td>$8.71</td>
</tr>
<tr>
<td>Y L COLES PARACETAMO 24PACK</td>
<td>$0.79</td>
</tr>
<tr>
<td>ORAL B TOOTH &amp; GUM C 130GRAM</td>
<td>$4.29</td>
</tr>
<tr>
<td>YLC COTTON TIPS 200P 200PACK</td>
<td>$0.99</td>
</tr>
<tr>
<td>ORANGE POWER SHWR BT 750ML</td>
<td>$4.39</td>
</tr>
<tr>
<td>PRIZE MEDAL TOILET S 5PACK</td>
<td>$3.19</td>
</tr>
<tr>
<td>SAFE UNBLEACH TOILET 6PACK</td>
<td>$2.89</td>
</tr>
</tbody>
</table>

**Total for 9 items** $31.25

**EFTPOS** $31.25

**GST INCLUDED IN TOTAL** $1.98

---

Look at the **DOCKET** and answer these questions:

1. What hours is the supermarket open?
2. What date and time were the items purchased?
3. How much did this person spend?
4. How much would you pay if you round the bill to the nearest dollar?
5. Round the bill to the nearest ten cents
6. What does the % symbol mean?
7. How much GST has been added?
8. What will the bill be without the GST added?
9. What does the -0.98 mean?
Checking labels and dockets: Supermarket shopping

**Sample Worksheet B2. Activity 2: Labels**

Look at one of the labels shown and in each case answer the following questions:

1. What item is being sold?
2. What type of food item is it (e.g. dairy, meat, vegetable, sweets)?
3. How much will this item cost to buy?
4. How much change would you get if you paid with a $10 note?
5. What is the unit price of this item?
6. When should you eat it by?
7. How much does it weigh?
8. How much would it cost you to buy 1/4 kilogram of this item?

Look at all four of the labels together and answer the following questions:

9. How much will it cost to buy all four items?
10. How much change would you get if you paid with a $50 note?
11. Which is the cheapest item per kilogram?
12. Which item will last the longest?
13. How much do all the four items weigh?

---

**SALAMI**

- **Net WT**: 0.325 kg
- **Price/kg**: $19.95
- **Total Price**: $6.48
- **Use By**: 10.11.10

**BACON**

- **Net WT**: 0.525 kg
- **Price/kg**: $10.45
- **Total Price**: $5.49
- **Use By**: 10.11.10

**TOMATOES**

- **Net WT**: 0.975 kg
- **Price/kg**: $6.29
- **Total Price**: $6.13
- **Use By**: 07.11.10

**FETA CHEESE**

- **Net WT**: 0.325 kg
- **Price/kg**: $19.95
- **Total Price**: $6.48
- **Use By**: 10.11.10
Checking labels and dockets: Supermarket shopping

Activity 3: More on supermarket labels and dockets

You could ask your students to choose one label/docket and have students answer questions that are more complex. They could consider comparisons between different types of foods (e.g. tasty, edam and cheddar cheeses). Questions may include ones such as on the earlier sample worksheets or as in the following worksheet, B2. Activity 3: Supermarket labels.

You can create different worksheets by altering the details on the labels as follows:

• Remove the unit price and ask them to work it out.
• Remove the total price and ask them to work it out.
• Remove the weight and ask them to work it out.
• Ask them to work out how long they have to consume the item, given the use by date.
• Any combination of these.

You may also ask the following:

• Put several labels/dockets and ask them to work out total cost for them.
• How much change would you get from various money amounts given (e.g. $20 or $50)?
• What prices are you prepared to pay for such items?
Activity 3: Supermarket labels

Some questions: Prices
1. How much would you pay altogether if you bought these four items?
2. How much change would you get if you paid for the Tasty Cheese with a $10 note?
3. How much would it cost you if you bought twice as much of the Frankfurts?
4. How much would it cost you if you bought exactly 1/4 kg of the Olives?
5. How much would it cost you if you bought 0.275 kgs of the Tasty Cheese?

Some questions: Measurement
1. Put the items in the correct order of their Use By dates?
2. Put the four items in the correct order of their net weight from lightest to heaviest?
3. What is the weight of the Olives in grams (g)?
4. Which packet has the weight closest to a 1/2 kg?
## Activity 3: Supermarket labels

### OLIVES

<table>
<thead>
<tr>
<th>NET WT</th>
<th>PRICE/kg</th>
<th>TOTAL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.500kg</td>
<td>$21.60</td>
<td>$</td>
</tr>
</tbody>
</table>

- **USE BY**: 07.11.10

### POTATOES

<table>
<thead>
<tr>
<th>NET WT</th>
<th>PRICE/kg</th>
<th>TOTAL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.50kg</td>
<td>$2.20</td>
<td>$</td>
</tr>
</tbody>
</table>

- **USE BY**: 03.12.10

### LEG HAM

<table>
<thead>
<tr>
<th>NET WT</th>
<th>PRICE/kg</th>
<th>TOTAL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.450kg</td>
<td>$18.85</td>
<td>$</td>
</tr>
</tbody>
</table>

- **USE BY**: 02.11.10

### EDAM CHEESE

<table>
<thead>
<tr>
<th>NET WT</th>
<th>PRICE/kg</th>
<th>TOTAL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.250kg</td>
<td>$11.90</td>
<td>$</td>
</tr>
</tbody>
</table>

- **USE BY**: 09.12.10

### Some questions: Prices

1. Using the labels above work out how much you will need to pay for the amount you are buying given the unit price of each item?
2. How much would you pay altogether if you bought these four items?
3. How much change would you get if you paid for the Edam Cheese with a $10 note?
4. How much would it cost you if you bought 0.450 kg Honey Ham @ $16.80 /kg instead of the Leg Ham?
5. How much would it cost you if you bought exactly 1/4 kg of the Olives?
6. How much would it cost you if you bought 0.250 kg of the Tasty Cheese@ $9.90 instead of the Edam Cheese?
7. What prices would you normally pay for these items? Do you think any are good buys?
Value for your money: Unit prices

Aims and overview
The aim of this section is to review and extend calculation skills related to unit prices and comparisons.

Key Maths Concepts
- Comparisons and base lines
- Standards in units of mass (weight) and capacity (liquid volume): gram (g), kilogram (kg), millilitre (ml), litre (l)
- Unit prices or price rates e.g. dollars per kilogram, cents per 100gm.

Activity 1 Comparisons
Provide empty packages of a range of common supermarket goods and get students to read the labels and discuss the information that is on them. You need to have multiples of the same products – but different brands and/or different sizes. You also need to include their prices. You may need to provide these on an accompanying list.

Summarise what the students find on the white board and ensure they are comparing their prices versus their size. Explain that this is called unit pricing. Use posters or packages you have collected to pose situations where a comparison and a choice need to be made about a product. Discuss the importance of estimation and quick mental calculations in a ‘shopping’ environment.

Pose that if you want to save money when shopping, it’s a good idea to compare prices. While it is easier to compare prices for identical items, it’s not so easy to compare prices when the same item comes in different quantities. The idea of a base line from which to compare will come up, so lead them to discuss standard measures as the basic need to genuine comparison and decision making.

Sometimes it is easy to decide which item is the better value in terms of quantity, such as when one item has double the quantity of the other.

For instance, 2 litres of orange juice for $4.91 is better value than 1 litre for $2.69, simply because $2.69 \times 2 = 5.38$, which is greater than $4.91$. Other factors may influence the decision on which size orange juice to purchase, but at least the shopper should be aware of the 47c price difference. For example, if you live by yourself, you might not be able to drink all the 2 litres of orange juice before it deteriorates.
Value for your money: Unit prices

Activity 2 Value for money

Replicate or photocopy Worksheet B3. Activity 2: How much do you get? Ask students to find out the costs of the same or similar products (three different sizes or brands) and answer the following questions and complete the worksheet:

- find out the price of the food
- research how the product’s unit cost is calculated (visit a supermarket or visit online supermarkets).
- calculate the unit cost for your product.
- compare your products unit costs with other similar products but a different brand.
- record the results in the table.

Worksheet B3. Activity 2: How much do you get?

<table>
<thead>
<tr>
<th>Item:</th>
<th>Brand:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net amount:</td>
<td>Price:</td>
</tr>
<tr>
<td>Unit cost:</td>
<td></td>
</tr>
</tbody>
</table>

Compare your product’s unit costs with at least two other similar products but a different brand.

<table>
<thead>
<tr>
<th>Item:</th>
<th>Brand:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net amount:</td>
<td>Price:</td>
</tr>
<tr>
<td>Unit cost:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item:</th>
<th>Brand:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net amount:</td>
<td>Price:</td>
</tr>
<tr>
<td>Unit cost:</td>
<td></td>
</tr>
</tbody>
</table>

Which product had the lowest unit cost?

Which product would you buy? Why?
Value for your money: Unit prices

**Activity 3: More on unit prices**

You can use Worksheet B3. Activity 3: Unit prices as further practice about calculating unit prices.

Ask if students had noticed that the price labels in supermarkets actually include unit pricing information. You could ask them to visit the Federal government website that explains this policy and provides information about how shops are supposed to display unit prices. The above Worksheet has some information that you could use to guide them through the investigation. The Australian Competition & Consumer Commission (ACCC) page about unit pricing is:

- See under *Units of measurement* for information about what unit should be used: [http://www.accc.gov.au/content/index.phtml/itemId/878396#h2_102](http://www.accc.gov.au/content/index.phtml/itemId/878396#h2_102)
Activity 3: Unit prices

1. When Tim goes shopping, he ignores brand names and looks at unit prices. Using any mental calculation or estimation you like, compare the weight or capacity of the products below and choose the best value for money in each case:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price A</th>
<th>Price B</th>
<th>Price C</th>
<th>Best value for money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange juice</td>
<td>1 litre for $2.69</td>
<td>2 litre for $4.91</td>
<td>3 litre for $5.87</td>
<td></td>
</tr>
<tr>
<td>Tomato paste</td>
<td>140 g for $1.78</td>
<td>250 g for $2.35</td>
<td>500 g for $2.74</td>
<td></td>
</tr>
<tr>
<td>Coca Cola</td>
<td>375 ml can for $1.00</td>
<td>1.25 litre bottle for $1.32</td>
<td>2 litre bottle for $2.09</td>
<td></td>
</tr>
<tr>
<td>Toilet rolls</td>
<td>$1.59 for 2</td>
<td>$3.09 for 4</td>
<td>$4.49 for 6</td>
<td></td>
</tr>
</tbody>
</table>

2. If you were asked to calculate unit prices for perfumes, would you calculate prices per litre, per 100 ml, or per 25 ml. Give reasons for which of these unit prices you chose.

3. Calculate unit prices (per 100 ml) for each of the items shown below and complete the following table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
<th>Price per 100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$89.95</td>
<td>100 ml</td>
<td>$89.95</td>
</tr>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$39.95</td>
<td>25 ml</td>
<td></td>
</tr>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$59.95</td>
<td>50 ml</td>
<td></td>
</tr>
<tr>
<td>Sea wind fragrance</td>
<td>$41.95</td>
<td>100 ml</td>
<td>$41.95</td>
</tr>
<tr>
<td>Sea wind fragrance</td>
<td>$29.95</td>
<td>50 ml</td>
<td></td>
</tr>
<tr>
<td>Frank &amp; Stein Homme fragrance</td>
<td>$79.95</td>
<td>100 ml</td>
<td>$79.95</td>
</tr>
<tr>
<td>Spring dew fragrance</td>
<td>$109.95</td>
<td>150 ml</td>
<td></td>
</tr>
</tbody>
</table>
Activity 3: Unit prices

On a separate page, rule a number line marked in tens from $10 to $150. Place your answers from Q3 on the number line. From your findings, can you quickly see which is an average priced perfume and which is the most and least expensive?

4. Answer the following questions about working with unit prices.
   (a) What mental calculations were the most useful for making your decisions in these situations?

(b) Should unit prices always be cheaper for larger quantities? Does that encourage people to buy more than they need?

(c) For which products did the largest quantity not give the lowest unit price?

5. Government regulations

Did you know that the price labels in supermarkets actually include unit pricing information? Look at these examples. How are the unit prices expressed?

The Federal government website below explains this policy and provides information about how shops are supposed to display unit prices.

Sales and Savings: Discounts and Sales

Aims and overview
The aim of this section is to review and extend percentage calculations in dealing with discount and sale amounts.

Key Maths Concepts
- Finding ways to shop smart and stay within a savings plan.
- Discounts on sale items and the percentage calculations involved.
- Small costs over long periods of time.

Activity 1: Review and Practice
Review and practice a range of relevant mathematical calculations including division, rounding off of decimals related to money, and percentages.

- Note that some calculators do not round money to two decimal places.
- Some learners may have difficulties when dividing, so encourage effective use of a calculator.
- Review and practice calculating a percentage of an amount (both in the head and by calculator methods).
- Remind students of possible ways of calculating percentages by explaining and demonstrating the following methods in class. You can also write this up as a poster either on a whiteboard or a wall.
- Then ask students to calculate percentages in various simple everyday situations. Some possible examples are given in the sample worksheet below.

Calculating percentages (%)
- In-the-head method: 10% move decimal point 1 place to the left. 1% move decimal point 2 place to the left.
- Pen-and-paper Formula: \% of an Amount($) = Amount($) ÷ 100 x \% Rate
- Shopper's calculator: Amount($) x Rate \% (do not press =)

Sample Worksheet B4. Activity 1- Percentage Review

1. What is?
   (a) 10% of $50
   (b) 5% of $50
   (c) 30% of $50
   (d) 10% of $100
   (e) 5% of $100
   (f) 30% of $100

2. Find 10% of $30.50

3. A toaster cost $44 and I got a 5% discount, what did I pay for it?

4. A weekend surfing course costs $250.00, how much will it cost with GST added?
Sales and Savings: Discounts and Sales

Activity 2: Looking for Sales and Discounts

Use supermarket/department store catalogues as references or go to some online shops and find best buys and work out discounts and compare prices based on different types of discounts. Discuss sales labels and discount announcements.

Show students the three different ways of working and calculating with percentage discounts:

1. To work out a percentage of an amount use: % of an Amount($) = Amount($) ÷ 100 x % Rate
2. To work out what the percentage discount is when you know the discount amount, use:
   % Discount = Discount Amount($) ÷ Original cost($) x 100
3. To work out what the original cost was if you know the price with the % discount included, use:
   Original cost($) = Discounted Price($) ÷ (100 - % Rate) x 100

Worksheet B4. Activity 2: Sales calculations, is provided as an example of the types of questions you could ask students.

Activity 3: From Little Costs Big Costs Grow

Ask the class to name something they use or buy regularly each day or week (e.g. magazines, music, soft drinks) then list them on the board or large poster paper. Next to each item list estimated cost per year. Take the time to go over some of the quick calculations necessary and a reminder of days, weeks and months in a year would not hurt.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per week/month</th>
<th>Cost per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magazine- Dolly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP3 Downloads</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 2: Sales calculations

Clothing and Footwear Sale

1. If the prices shown are the regular prices before the discounts are taken off, how much would you pay for each of the following items after you take off the percentage (%) discount?

- Men's hiking boots.
- Women's patent pumps.
- Children's sandals.
- Natural fibre hat.
- Retro sunglasses.
- Women's casual t-shirt.
- Women's pinstripe trousers.
- Women's pinstripe jacket.
- Men's shirts.
- Men's tie.
- Men's pinstripe suit pants.
Activity 2: Sales calculations

Audio and Music Sale

2. If the prices shown are the regular prices before the discounts are taken off, how much would you pay for each of the following items after you take off the percentage (%) discount?

- The 4GB MP3 player. .................................................................
- The 8GB MP3/MP4 player. ......................................................
- The Indoor/Outdoor Speakers. ................................................

3. If the prices shown are the regular prices before the discounts are taken off, how much is the percentage (%) discount on the regular price for each of the following items?

- The Earphones. ......................................................................
- The Over-the-Head Headphones. ...........................................
- The Bookshelf Speakers. .......................................................
- The New Release CDs. ...........................................................

4. If the prices shown are the discount prices after the discounts are taken off the regular price, how much was the regular price for each of the following items?

- The 4GB MP3 player. .............................................................
- The 8GB MP3/MP4 player. ....................................................
- The Indoor/Outdoor Speakers. ..............................................
Budgeting to balance income and expenses - Introduction

Aims and overview
The aim of this section is to teach basic money management skills. Topics include: setting goals, balancing your income and expenditure, the process and purpose of budgeting, having savings plans, and the relationship between income, expenses and savings.

Key maths concepts
The following areas are covered in this section:

- Definition/meaning of financial terms and expressions such as: earnings, wages, income, gross tax, net income, savings, expenses, debt, annual, quarterly, monthly and fortnightly.
- Calculations related to the following equation:
  \[ \text{Savings and/or Bottom line} = \text{Income} - \text{Expenses} \]
- Knowledge and understanding about personal financial situations and budgeting, balancing income and expenses (savings plans) and strategies to help keep finances in balance.

Learning outcomes
At the end of this unit, students should be able to:

- Establish if a financial goal is realistic/obtainable
- Decide on and develop a savings plan to achieve a goal
- Explain the advantages in setting up a savings plan
- Explain the principles of budgeting and constructing a personal budget
- Calculate totals, differences and portions (%) of amounts of money.

Useful resources

Please refer to Resources page in Additional Resources.
Budgeting to balance income and expenses - Introduction

Background information

Young consumers face considerable pressures to consume, and to consume now, rather than later. Some young people have a great deal of spending power: the average 15 year old has an income of $64 a week and this amount increases to $186 a week for a 17 year old (YouthSCAN 2007).

Equally important is the debt created by the pressure to have expensive possessions; e.g. almost 90% of 15 year olds have a mobile phone, and almost 100% of 17 year olds have one. This high level of mobile phone ownership often results in phone bills being a major source of financial difficulty and debt. (The article ‘Young ring up huge mobile bills’ on p. 72 of the CAV Consumer Stuff Commerce resource book is relevant reading).

The need to improve their financial literacy grows greater every day. In a fast changing world with job security a concern, an increase in the need and cost for higher education, and a rising pressure to purchase new products, learning how to manage money has become even more essential.

To become money smart means having the skills to manage your money, to ask the right questions and to know who to ask. Basic money management skills are:

- setting financial goals
- drawing up budgets
- developing a savings plan.

These are stepping stones, and combined with confidence in their ability to understand the concepts and mathematical processes involved, young people can successfully take responsibility for managing their own money and finances.

Activities and worksheets

C1: Budget for a class event
C2: Income – where does money come from?
C3: Income – paying tax
C4: Expenses – where does your money go?
C5: Budget and savings plan for everyday living
C6: Budget and savings plan to get what you want
Budget for a class event

Aims and overview
This section is a whole group activity where students become aware of the concept of balancing income and expenses in order to achieve a tangible goal in a real life situation.

Activity 1: Brainstorm
We have all seen people deal with money and have had and spent our own money. We all have opinions on the value of having money. To introduce this unit, present your students with the following sayings about money. Ask your students how they feel about the sayings, and whether they reflect reality.

• ‘Money is power’
• ‘Put your money where your mouth is’
• ‘Money does not grow on trees’.

Ask the students if they know of other sayings about money, and discuss these too.

As a follow up, brainstorm as a class what the students like to spend their money on or would like to if they had the money (e.g. mobile phones, computers, trips, gifts, entertainment). Ask them what they think is involved in being successful in obtaining the goal that they want.

Activity 2: A budget and a savings plan
Introduce the idea of a class project for which students will put into practice a savings plan and a budget. The intention is to do this as part of doing something together as a class, e.g. to go on a trip or excursion, or celebrate the end of semester (term or end of unit). This could be a picnic/BBQ, going to a movie, a pizza party or a trip.

The following is a list of tasks the students could undertake to work towards such an event:

• Brainstorm and decide on possible activities and come up with a short list of two or three.
• Research the costs involved for each activity.
• Choose one of the activities based on interest and affordability.
• Set up a list of costs (e.g. transport, food, entertainment, accommodation, phone calls, etc).
• Encourage students to use a spreadsheet to record the costs. You could provide them with a worksheet with the headings set out for them to use.
• Calculate the totals and the dates when each amount is required.
• Decide on how the students can generate income to cover the costs and document this in the same table or spreadsheet.

Discuss and decide on how the students will:

• Keep a record of income and expenses (e.g. a book or a spreadsheet recording each student’s contributions and the set expenses).
• Find other income sources and monitor income, especially if there is a shortfall in income.

While this project has been set up as a detailed introductory activity, it can be used successfully as an end of unit activity lasting a shorter time and containing less detail.

On the next page is a sample worksheet, C1 Activity2: Budget for a class event. This can be used to help students work through the activity.
# Activity 2: Budget for a class event

## Budget for a class event

**Event name:** .................................................................

**Expenses:** To do this we will need money for:

<table>
<thead>
<tr>
<th>Item</th>
<th>Date needed</th>
<th>Estimated cost</th>
<th>Actual cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport (e.g. train, tram, bus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event costs (e.g. Tickets, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total money needed - costs**

**Income:** The money will come from:

<table>
<thead>
<tr>
<th>Source</th>
<th>Date needed</th>
<th>Estimated income</th>
<th>Actual income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly contributions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fund raising activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total income received**

You now need to look at your BOTTOM LINE (i.e. income – costs)

- If estimated income – estimated costs = a POSITIVE $ amount then the plan is OK
- If estimated income – estimated costs = a NEGATIVE $ amount then either income needs to be increased and/or costs need to be reviewed and reduced

*This leads to a savings plan.*
Income - Where does money come from?

Aim and overview

The aim of this section is to introduce students to how workers earn money and how they are paid their wages and income.

Key concepts

The following areas are covered in this section:

- Time sheets and how to calculate hours of work.
- Definition/concept of: wage, salary, commission, piecework, penalty rates, annual, quarterly, monthly and fortnightly.
- Calculating a percentage of an amount: in-the-head, pen and paper, and calculator methods.
- The formula: Sales – Costs = Profit

Activity 1: Earning money

Ask students if any of them earn any money.

- Who works? Where? What are your rates of pay?
- Do you get paid pocket money? How much?
- Do you get pocket money for doing set house work?
- Are you aware of your work rights?
- Where could you go for information and protection?

Introduce the following organisations:

- Consumer Affairs Victoria (CAV) – www.consumervic.gov.au
- Fair Work Australia – www.fwa.gov.au

Activity 2: Review and Practice

Review and practice a range of relevant mathematical calculations including division, rounding off decimals in relation to money and percentages.

- Note that some calculators do not round money to two decimal places.
- Some learners may have difficulties when dividing, so encourage effective use of a calculator.
- Review and practice calculating a percentage of an amount (using in-the-head, pen-and-paper and calculator methods).
- Remind students of possible ways of calculating percentages by explaining and demonstrating the following methods in class. You can also write this up as a poster either on whiteboard or a wall.
- Then ask students to calculate percentages in various simple everyday situations.
Income - Where does money come from?

Calculating %

- **In-the-head method**: 10% move decimal point 1 place to the left.
  1% move decimal point 2 place to the left.
- **Pen-and-paper Formula**: \( \text{Amount(\$)} \div 100 \times \text{Rate} = \% \text{ of Amount(\$)} \)
- **Shopper's calculator**: \( \text{Amount(\$)} \times \text{Rate} \% \) (do not press =)

**Activity 3: Working for a salary/wage**

Introduce various ways that people earn money and then use C2. Activity 3: Income calculations to practise a range of calculations related to earning an income.

**Activity 4: Working for yourself**

Introduce the idea of working for yourself. Ask students if they have any skills or ideas that they could be use to set up and run a small business from home or school, or to run a stall at a market. Discuss issues related to undertaking such a task, especially the need to take into account all costs and expenses.

Introduce the following concept and formula:

**Sale Price – Costs = Profit**

Refer to the sample worksheet below C2. Activity 4: Selling Muffins and get students to work out if Sophie and Tim made any money at the stall.
Income - Where does money come from?

Sample worksheet C2. Activity 4: Selling Muffins

Sophie and Tim have a great recipe for making blue berry muffins so they decide to make and sell muffins at a local Sunday market. They make and sell 4 dozen muffins at $2 each. Cost of materials (blue berries, flour, sugar, butter) was $6 for each one dozen muffins, and they estimate their combined labour at $14 /hr and it took 1.5 hours to shop for and cook the 4 dozen muffins. Fill in the following summary sheet for them and work out if Sophie and Tim made any money that Sunday.

<table>
<thead>
<tr>
<th>Sales</th>
<th>Costs</th>
<th>Sales - Costs = Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 dozen @ $2 each muffin =</td>
<td>Cost of materials =</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of labour =</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cost =</td>
<td></td>
</tr>
</tbody>
</table>

1. How do you think they worked out their material costs?
2. Did they charge enough for their labour?
3. Did they charge enough for their muffins?
4. How long would they have worked at the market?
5. If there had been a charge per stall of $12 for the day, what would their profit be then?
6. Have they forgotten to take anything else into account?

After completing this task, you could set up other possible scenarios and get students to use the Sale Price – Costs = Profit formula in order to work out:

- Cost of materials
- Cost of labour
- Decide on profit required
- Decide on a sale price needed to achieve that profit.

Extensions

As a follow up, if there seems to be an interest in running such income generating activities, set a research task for students to find out what they need to do to set themselves up as sole traders (e.g. get an ABN number, keep record of income, fill in tax forms etc).

Students can work through pp 31- 38 of the CAV Consumer Stuff Commerce resource book. This work is on establishing a small business, and is very relevant to this section.

Students who may struggle with the work covered in this section may be directed to Unit 5, What is an Economy? This activity is in the Consumer Stuff resource book, Consumer Stuff For Kids.
### Activity 3: Income calculations

Some workers receive a **wage**, which is paid per hour, day or week. Other workers receive a **salary**, which is a yearly amount that is usually paid fortnightly as a regular fixed amount.

1. Louise earns a salary of $48,800 a year working in the kitchen with a chef. What is
   (a) her weekly income; and
   (b) her monthly income?

2. George is a casual bartender who is paid $15.50 an hour. Can you work out his total earnings this week from the timesheet he submitted?

<table>
<thead>
<tr>
<th>Day</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>6:45pm</td>
<td>7pm</td>
<td>6:30pm</td>
<td>5pm</td>
<td>3:30pm</td>
</tr>
<tr>
<td>Finish</td>
<td>10:30pm</td>
<td>11:30pm</td>
<td>10pm</td>
<td>10:45pm</td>
<td>8:30pm</td>
</tr>
</tbody>
</table>

Some sales staff are paid a **commission**, based on the percentage of the sales or profit they make. Some are also paid a small annual salary, called a **retainer**.

3. Robert is a real estate agent, and last week he sold a house for $350,000 at 3% commission. What did he earn in commission?

4. Mary sells cars at the car dealer on High Street. She earns an annual retainer of $6,500 plus a commission of 25% on the profit made on car sales. What did she earn last week when her car sales realised a profit of $4,248.00?

5. Paula sells hair care products on a fortnightly retainer of $350 plus 10% of sales. How much did she earn last fortnight after she sold $1420 worth of products?

Some workers earn money doing **piecework**. They are paid according to the number of items they make, write or pick.

6. Vince is a student who earns money in the summer holidays picking fruit such as apricot and peaches. On a good day he can pick 12 buckets of fruit for which he is paid $8 a bucket. If he picks at this rate for 6 days, how much will he earn?

Some jobs pay **penalty rates** for work completed outside of normal hours. Examples of penalty rates are time-and-a-half and double-time which may apply for extra hours or public holiday work.

7. Van works at a large supermarket and is paid $17.55 an hour for a standard 38 hour week. If he works overtime he is paid time-and-a-half rates for the extra hours up to 48 hours, and double-time after that. How much will he get paid for working a 50 hour week?
Income: Paying tax

Aims and overview
In this section students will be introduced to paying tax as part of earning wages.

Key Maths Concepts
The following concepts will be covered:

- What is taxation and why do we have it.
- Definition of: income, deductions, superannuation, net pay, “take-home” pay, rate, earnings, wages, income, gross tax, net income.
- Calculating a percentage of an amount: in-the-head, pen-and-paper and calculator methods.

Activity 1. Taxes
Have a class discussion or set an internet-based research task about the questions:
Why do we pay tax? What types of taxes are there? What sort of things are our taxes spent on?
Don’t forget to include the GST – another opportunity to use and apply percentages.

Activity 2. Pay slips, income tax rates and superannuation
Ask the class what they know about how income tax instalment/payments are calculated? And do they know about superannuation and how that is calculated? Does anyone work and receive pay slips? What information is on the payslip?
You could start by handing out copies of the sample payslips provided opposite to discuss the different terms listed below and how pay is calculated and deductions made in order to get at the net income or take-home pay.
Alternatively, or as an additional exercise, you could ask students to research what the following terms mean and how they are calculated:

- gross pay
- superannuation
- health fund contributions including the Medicare levy
- other deductions
- net pay

Use the table below or a more recent tax table to demonstrate how superannuation is calculated as well as how the different tax rates are applied and calculated to a person’s annual taxable income.

Provide further examples of calculating superannuation and tax payable for different amounts of income. A sample worksheet, Worksheet C3. Activity 2: Paying tax, is provided as an example.

You will need to find and have available the current taxation rates and the compulsory employer superannuation contribution rate (called Superannuation Guarantee – SG). This compulsory employer contribution to an employee’s superannuation is currently set at 9% of salary. The available rates including taxation calculators are available online from the Australian Taxation Office (ATO) at: http://www.ato.gov.au/.
Income: Paying tax

Sample Pay slips

<table>
<thead>
<tr>
<th>Employee: Anita Smith</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
</tr>
<tr>
<td>18.5</td>
</tr>
<tr>
<td>Year to date</td>
</tr>
<tr>
<td>2,400.75</td>
</tr>
</tbody>
</table>

PAY SLIP

EMPLOYEE: NADIA ZIRKOFF
WEEK ENDING: 03/12/10

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>HOURS</th>
<th>RATE PER HR:</th>
<th>GROSS PAY</th>
<th>OTHER DEDUCTIONS - UNION FEES</th>
<th>TAX AMOUNTS WITHHELD</th>
<th>NET PAY</th>
<th>SUPER-ANNUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Hours</td>
<td>38.00</td>
<td>35.00</td>
<td>1330.00</td>
<td>15.50</td>
<td>297.00</td>
<td>1017.50</td>
<td>119.70</td>
</tr>
<tr>
<td>YEAR TO DATE</td>
<td>30590.00</td>
<td>356.50</td>
<td>6831.00</td>
<td>2340.25</td>
<td>2753.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tax rates

The following tax rates for 2010–11 apply from 1 July 2010:

<table>
<thead>
<tr>
<th>Taxable Income</th>
<th>Tax on this income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 - $6,000</td>
<td>Nil</td>
</tr>
<tr>
<td>$6,001 - $37,000</td>
<td>15 cents for each $1 over $6,000</td>
</tr>
<tr>
<td>$37,001 - $80,000</td>
<td>$4,650 + 30 cents for each $1 over $37,000</td>
</tr>
<tr>
<td>$80,001 – $180,000</td>
<td>$17,550 plus 37c for each $1 over $80,000</td>
</tr>
<tr>
<td>$180,001 and over</td>
<td>$54,550 plus 45c for each $1 over $180,000</td>
</tr>
</tbody>
</table>
Income: Paying tax

Sample Worksheet C3 Activity 2: Paying tax

Workers usually do not take home the full amount of pay they have earned, which is called their gross pay.

This is because employers deduct certain amounts such as tax, which is forwarded to the Australian Tax Office. Other deductions include compulsory employer superannuation contributions, superannuation payments and health fund contributions. Workers receive their net pay also called their “take-home” pay, which is their gross pay minus the deductions and their tax.

Work out the take-home pay for the following two people.

1. Anita works in an office and earns $1,440 gross a fortnight. She pays $188.00 in tax and contributes $30 in union fees and $5 to the social club. What is her take home pay each fortnight?

2. Jim works for a construction company and receives a gross salary of $665 a week. His employer deducts $82.00 a week for tax and $15.00 union fees.

Use the income tax deduction table provided by your teacher and the current rate of the compulsory employer superannuation contribution to calculate the take home pay and their superannuation payment for the following workers. Note: This assumes there are no other deductions.

1. Nadia works for a finance company and receives a gross salary of $52,450 per year. Use the tax table to work out how much tax she should pay in a year. How much does her employer contribute to her superannuation per year?

2. Joe works in an automotive centre and gets paid a gross salary of $535 a week. Use the tax table to work out how much tax he should pay in a year. How much does his employer contribute to his superannuation per year?

3. Anthea works in a legal firm and earns $1,850 gross a fortnight. How much tax is she due to pay in a year if she has no other deductions? Based on this, what is her take home pay per fortnight?

4. Lauren is a part-time cleaner who earns $180 a week. How much tax will she have to pay a year? How much does her employer contribute to her superannuation per year?

Extension: Tax returns

If it is tax time, you can work with students to show them how to complete a taxation return. These can be now completed online (go to http://www.ato.gov.au/) for the web address and information or they can be submitted using Tax return booklets that are available from post offices. The hard copies contain multiple forms and students can try filling in their own tax returns or alternatively you could provide some fictitious income and expenses for them to use in class.
Spending: Where does your money go?

Aim and overview
The aim in this section is to look at how people spend their money.

Key concepts
The following concepts can be covered:

- Definitions/concepts of: rent, council rates, taxation, insurance, loans/credit and interest.
- Types of insurance including health, car, accident, property insurance.
- Calculating a percentage of an amount: in-the-head, pen-and-paper and calculator methods.

Activity 1: Expenses
Have a class discussion around what students spend their money on. You could start by asking them to each make a list of what they spend their money on, and then compile a combined list on the board. They could then try to sort them into the five categories on which students in the class spend the most amount of money.

YouthSCAN 2007 indicated the following key areas of expenditure of income earnt by young people:

- Kept as cash
- Save for a purpose
- Snacks/Confectionery
- Clothes/Shoes
- Intend to bank
- Entertainment
- Presents
- Magazines

You could also ask if anyone has a credit card (you may need to explain the difference between a debit and a credit card) or if anyone has taken out a loan. Let students know that they will do some work in a later section (Section E) on credit cards and loans.

Activity 2: An expense
Ask students to choose one thing they believe they spend a significant amount of money on (e.g. music, technology, games, clothes, Internet) and ask them to estimate and workout how much it would cost you over one year.

Consider discussing the concept of ‘spending leaks’ with your class. This concept shows how some basic shopping skills can save a consumer considerable money over a period of time. The Women Understanding Money in Australia – A Financial Literacy Guide in 11 languages section of the WHIN website demonstrates this concept well. Refer to Useful Resources at the start of this section.
Activity 3: Where does your money go?

Give students a copy of Worksheet C4. Activity 3: Where does your money go? Ask students to work in small groups of two or three students to complete Part 1.

At the end of Part 1, discuss each of the three scenarios and summarise the different groups’ responses. Make sure you bring to student’s attention areas of expenditure that they may not be aware of such as insurances, council rates, utility bills, etc.

Then ask the students to continue to work in their small group and select one of the options in Part 2 and complete the research and questions on the worksheet.
### Activity 3: Where does your money go?

#### Part 1. Three scenarios: “Where does the money go?”

Research and discuss the question “Where does the money go?” in the following three situations for a young person. You need to consider costs such as rent, mortgage, food, clothes, insurance, car running costs, etc. You may need to talk to other people — your older brothers and sisters, your parent/s or friends to get estimates of the costs. List your findings with respect to:

(a) A single young person at home  
(b) A single young person living away from home  
(c) A single or couple living in their own home.

<table>
<thead>
<tr>
<th>Scenario:</th>
<th>Where the money goes</th>
<th>Prioritise from the most expensive down</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario:</th>
<th>Where the money goes</th>
<th>Prioritise from the most expensive down</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario:</th>
<th>Where the money goes</th>
<th>Prioritise from the most expensive down</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 3: Where does your money go?

Part 2. Three investigations – select one

1. You are required to take out health insurance as a single person.
   (a) Research different health insurance schemes.
   (b) Decide what services you believe you will use. List them.
   (c) Research the insurance companies that offer the best deal for you? List three of them.
   (d) Which one would you choose and why?
   (e) Are you surprised how much health insurance costs?

2. You have just bought a new ‘pre loved’ car. It cost you $8,000.
   (a) Research/discuss what other expenses will you now have to allow for.
   (b) List them and estimate the cost involved for each one.
   (c) Are you surprised how much cars cost to run?

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated costs</th>
<th>Estimated cost per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. You want to go on a 10 day interstate trip with a friend at the end of the year.
   (a) Research/discuss where you will go and for how long?
   (b) Research/discuss what expenses will you have to allow for?
   (c) List them and estimate the daily and total cost involved.
   (d) Are you surprised how much such a trip costs?

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated cost per day</th>
<th>Estimated total cost for the trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel costs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Budgeting for everyday living

Aim and overview
This section involves a range of activities where students are introduced to the process of setting up a budget and a savings plan for a specific personal goal.

Key concepts
- Definitions/meanings of terms such as: budget, expense, income, net, annual, quarterly, monthly and fortnightly.
- Setting realistic financial goals.
- Using and calculating ratios of weekly, monthly, quarterly and yearly amounts.
- Rounding off, and in-the-head calculations for estimating.
- The concept and calculations involved in using the following formula:
  \[ \text{Savings} = \text{Income} - \text{Expenses} \]

Activity 1: Why budget?
Introduce the scenario - ‘What if you are living on a limited income and you are not living at your family home?’
- Suggest that limited income means a greater need to monitor expenditure.
- Re-introduce that Savings/Bottom line = Income – Expenses.
- Brainstorm some items of typical learner’s income and expenditure. Use the data collected to illustrate how weekly amounts are calculated.
- Re-introduce concept of a budget (refer back to the initial class project in Section B1: Budget for a class event)
- Discuss the level of accuracy and the level of certainty required to develop a budget plan.
- Provide examples that will reinforce the difference between calculations used to arrive at an estimate and those used to achieve results that are more accurate.

Activity 2: Budget templates and planners
Discuss the need to practise doing a budget and hand out the worksheet, C5 Activity 2: Budgeting for everyday living. This is an equally effective exercise whether students complete it individually or in pairs. Use it as an introduction to what needs to go into a budget.

Activity 3: Budgeting yourself
Introduce the scenario - What might be something that you want to budget for?
- Discuss the need for a budget and saving plan.
- Re-introduce that \[ \text{Savings/ Bottom line} = \text{Income} - \text{Expenses}. \]
Have some templates of budgets or get students to research the internet for samples of budgets. Remind students that a budget has three sections: income, expenses and savings and that for each section information will be need to be collected.
Budgeting for everyday living

A suitable site to access sample budget templates is:


This is the Fido Budget Planner page at the website of the Australian Securities and Investments Commission (ASIC).

Activity 4: Sample Budget

Worksheet C5 Activity 2: Budgeting for everyday living, should have set the scene about budgeting.

Use C5. Activity 4: Budgeting for you, to get students to write up a sample budget using a template they prefer. Students will need time to collect information for the various sections. The individual budget may be created on paper, in a Word document or a spreadsheet. (A couple of samples are set out in the worksheet).

Activity 5: Realities of budgets

Report / discuss the realities of sticking to a budget and getting what you want. The student responses may be recorded as:

(a) a structured individual report form,
(b) a class discussion (notes kept),
(c) a group generated set of strategies to be posted up in class
Activity 2: Budgeting for everyday living

Nick has left school, found a job, and moved into a share house with friends Sophie and Tim. He is keen to make ends meet and most of all not get into debt. He wants to set up a budget that will help him save enough money so he can get by now and maybe go on a trip in two years time. Nick needs to check his actual income and expenses at the end of each fortnight because he is paid fortnightly.

Nick sets up three tables of expenses (use a Word or an Excel document):
1. Expenses he pays once a year (annual) expenses
2. Expenses that come due monthly, every two monthly or quarterly (every three months)
3. Expenses that he has to deal with weekly or fortnightly (two weeks).

1. Your first task is to calculate Nick’s income, given that his job pays $1050 per fortnight after tax has been taken out. (This is his net income, as distinct from the higher figure of pre-tax income called his gross income.) Calculate Nick’s weekly and annual income based on the assumption that there are 52 weeks in the year that equals 26 fortnightly salary payments.

<table>
<thead>
<tr>
<th>Weekly income</th>
<th>Fortnightly income</th>
<th>Annual income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1050</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Your second task is to work out the expenses of bills that Nick will have to pay once a year. For a budget set up that really helps, you need to turn these into fortnightly expenses.

Complete the last two columns of the following table to turn yearly expenses into fortnightly or monthly amounts.

<table>
<thead>
<tr>
<th>Annual expenses</th>
<th>Yearly fee</th>
<th>Due date</th>
<th>Monthly estimate</th>
<th>Fortnightly calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car registration</td>
<td>$624</td>
<td>April</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car insurance</td>
<td>$900</td>
<td>April</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health insurance</td>
<td>$550</td>
<td>March</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gym membership</td>
<td>$330</td>
<td>May</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Further study fees</td>
<td>$420</td>
<td>Feb</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expenses – Task 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 2: Budgeting for everyday living

3. Your third task is to work out the bills that will have to be paid on either a quarterly (three months), every two months or monthly basis. Do the mental estimates column first and then the calculations.

<table>
<thead>
<tr>
<th>Service Bills</th>
<th>Frequency</th>
<th>Total</th>
<th>Monthly estimate</th>
<th>Fortnightly calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>every 2 months</td>
<td>$185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td>monthly</td>
<td>$100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>every 2 months</td>
<td>$155</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>quarterly</td>
<td>$105</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expenses – Task 3</strong></td>
<td></td>
<td><strong>$545</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Some of Nick’s expenses are based on weekly estimates so your fourth task is to turn these into estimates of fortnightly and monthly expenses. Do the mental estimates column first and then the calculations. Explain your method of calculation.

<table>
<thead>
<tr>
<th>Expense</th>
<th>Weekly</th>
<th>Monthly estimate</th>
<th>Fortnightly calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>$150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kitty (shared items, food, detergents, garbage bags etc)</td>
<td>$50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car loan</td>
<td>$75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petrol</td>
<td>$35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fares</td>
<td>$30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating out/take away</td>
<td>$50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet ISP</td>
<td>$10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entertainment</td>
<td>$75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clothes</td>
<td>$20</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expenses – Task 4</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 2: Budgeting for everyday living

5. Your fifth task is to calculate Nick’s total expenses for the year. Fill in the table below.

<table>
<thead>
<tr>
<th>Expense</th>
<th>Fortnightly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Expenses - Task 2</td>
<td></td>
</tr>
<tr>
<td>Total Expenses - Task 3</td>
<td></td>
</tr>
<tr>
<td>Total Expenses - Task 4</td>
<td></td>
</tr>
<tr>
<td>Total Expenses – Task 5</td>
<td></td>
</tr>
</tbody>
</table>

6. Your final task is to calculate Nick’s savings by using the formula;

\[
SAVINGS = INCOME – EXPENSES.
\]

Fill in the table below.

<table>
<thead>
<tr>
<th>Income / Expenses</th>
<th>Fortnightly Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income - Task 1</td>
<td></td>
</tr>
<tr>
<td>Total Expenses - Task 5</td>
<td></td>
</tr>
<tr>
<td>Savings/Bottom line = Income – Expenses:</td>
<td></td>
</tr>
</tbody>
</table>

If \( income – costs = a \text{ POSITIVE} \) $ amount then Nick’s financial situation currently is OK

If \( income – costs = a \text{ NEGATIVE} \) $ amount then:

***either income needs to be increased or

***costs need to be reviewed and reduced

This leads to a savings plan.

Does Nick need to set up a savings plan?
Activity 4: Budgeting for you

WHAT...You are keen to:

- go on an interstate or overseas trip
- organise and pay for an internet plan that will allow enough download for all your music and movie interests
- buy a mobile phone and continue to pay for a mobile phone plan
- buy a car (when you turn 18)
- other

WHEN...You would like to achieve this:

- now
- in 1 years time
- in 2 years time
- other

HOW...You need to set up:

- a budget that will help you know what your true financial situation is
- a savings plan that will save enough money so you can get what you want in the time that you want it
- a strategy to help you stick to your plan.

ACTION

Choose a budget planner that suits you. Set up your own personal budget to achieve your goal.

- decide whether you want to calculate all amounts on a weekly, fortnightly, monthly or yearly basis
- briefly explain how you worked out your costs.

RESULTS

Is my bottom line enough to achieve my goal?

DEBRIEFING

1. Some people start their budgeting with a savings target and adjust their income and expenditure in order to meet it. How and why might you do this yourself?
2. Despite keeping to their budget plan, some people still find it difficult to pay for expenses at the start of the year. How can this happen, and in what ways can this problem be solved?
3. Could you use a spreadsheet to monitor how closely you were keeping to your budget plan?
Activity 4: Budgeting for you

Sample Personal Budget Planner - Fortnightly

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money I earn</td>
<td>$____________</td>
</tr>
<tr>
<td>Money from family</td>
<td>$____________</td>
</tr>
<tr>
<td><strong>TOTAL MONEY I GET EACH FORTNIGHT</strong></td>
<td>$____________A</td>
</tr>
<tr>
<td>Supermarket shopping</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>$____________</td>
</tr>
<tr>
<td>Other</td>
<td>$____________</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
</tr>
<tr>
<td>Rent</td>
<td>$____________</td>
</tr>
<tr>
<td>Electricity</td>
<td>$____________</td>
</tr>
<tr>
<td>Gas</td>
<td>$____________</td>
</tr>
<tr>
<td>Water</td>
<td>$____________</td>
</tr>
<tr>
<td>Telephones</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>$____________</td>
</tr>
<tr>
<td>Mobile</td>
<td>$____________</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>Fares</td>
<td>$____________</td>
</tr>
<tr>
<td>Car: Registration</td>
<td>$____________</td>
</tr>
<tr>
<td>Repairs</td>
<td>$____________</td>
</tr>
<tr>
<td>Insurance</td>
<td>$____________</td>
</tr>
<tr>
<td>Petrol</td>
<td>$____________</td>
</tr>
<tr>
<td>Lifestyle</td>
<td></td>
</tr>
<tr>
<td>Take away /eating out</td>
<td>$____________</td>
</tr>
<tr>
<td>Sport</td>
<td>$____________</td>
</tr>
<tr>
<td>Magazines</td>
<td>$____________</td>
</tr>
<tr>
<td>Gifts/ parties</td>
<td>$____________</td>
</tr>
<tr>
<td>Clothing</td>
<td>$____________</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Medical/dental</td>
<td>$____________</td>
</tr>
<tr>
<td>School Charges</td>
<td>$____________</td>
</tr>
<tr>
<td>Computer /internet</td>
<td>$____________</td>
</tr>
<tr>
<td>Insurances (health/contents)</td>
<td>$____________</td>
</tr>
<tr>
<td>Loan repayments</td>
<td>$____________</td>
</tr>
<tr>
<td><strong>TOTAL MONEY I SPEND EACH FORTNIGHT</strong></td>
<td>$____________B</td>
</tr>
</tbody>
</table>
Activity 4: Budgeting for you

Total Money I Get Each Fortnight | Total Money I Spend Each Fortnight | Money I Have Left To Save Each Fortnight

A $_________________ - B$_________________ = C$_________________

Is Bottom line C Enough to Achieve My Goal?

Sample Personal Budget Planner - Spreadsheet

This is an example of what the template above would look like on a spreadsheet program like MS Excel. Being a sample it does not contain all the figures but it gives an idea of what one may look like.
Paying bills - Introduction

Aims and overview

The aim of this section is to teach basic management and maths skills to do with reading, checking and paying bills.

Key maths concepts

The following concepts are covered:

- Comparison using base figure or a checklist
- Standards in units involved in utility and service bills (kilowatt hrs, kilolitres, kilojoules)
- Using formulas to replicate the calculations to work out the cost of a service e.g. water or electricity costs
- Knowing your entitlements and asking for assistance are valid consumer rights.

Learning outcomes

At the end of this unit, students should be able to:

- Use research and estimation to establish if a price/cost is realistic and/or best value.
- Use the principles of comparison to:
  - Use base figures and checklists to assess reasonableness of amount of payments due (e.g. did I really make that many phone calls?)
  - Identify the best plan for phone or internet use.
- Calculate totals, differences, portions and percentage of amounts of money.

Useful resources


Please refer to Resources page in Additional Resources.
Paying bills - Introduction

Useful websites are:

- [http://www.consumervic.gov.au/](http://www.consumervic.gov.au/) which is the website for Consumer Affairs Victoria
- [http://www.consumervic.gov.au/consumerstuff](http://www.consumervic.gov.au/consumerstuff) which is the Consumer Education in Schools (CEIS) resource site

Background information

As noted in Section C, having the skills to manage our money, means being able to use these three stepping stones:

- setting financial goals
- drawing up budgets
- developing a savings plan.

The third one is the one addressed most directly in this section. Taking responsibility for the cost of living and for paying bills is vital in successfully applying and sticking to a savings plan and protecting the bottom line.

Activities and worksheets

- D1: Reading and paying bills
- D2: Sharing the bill
- D3: Home phone bills
- D4: Mobile phone bills
- D5: Internet charges
- D6: Water bills
Reading and paying bills

Aims and overview
The aim of this section is to become familiar with the format of utility and service bills and the meaning and importance of particular sections of bills.

Key concepts
- The format and structure of bills and invoices.
- Reading and paying bills is one of the responsibilities related to being a consumer.
- Complaints systems and processes.

Activity 1: Bills
Ask the class to set up a list on the board of bills they are familiar with. Ask how many students have bills they are responsible for paying?

Then open the discussion to the consequences of not paying or misunderstanding any of the requirements of bills. Take note of the answers and decide whether the students’ awareness of the consequences is adequate or needs input. (This will help decide whether guest speakers or further research may be beneficial. Consumer Affairs Victoria may be able, as part of an ongoing program in your school, to provide a consumer advisor to speak to student groups. Your school would need to integrate the role of the speaker into your teaching and learning activities. For more information, call 1300 55 81 81)

Activity 2: Reading bills
Set up a checklist of the main features of bills. Using a sample bill you have collected, with real name and address replaced by a fictitious one, and guide the class through finding the main features of a service/utility bill.

Set up a checklist of these features or turn this list into a set of guide questions to help students negotiate reading and understanding bills.

A sample set of questions is set out below in Sample Worksheet D1. Activity 1: Checklist for the main features of a bill. Issues you may want to discuss include:

- Payment methods (BPay, Direct Debit, Australia Post, Post Billpay, by mail, direct payment).
- Variation in the time there is to pay bills.
- What concession rates are and who is eligible.
- How you could check if you thought a bill was incorrect e.g. refer to past bills, check graph, check the meter reading etc.
Reading and paying bills

Sample Worksheet D1. Activity 1: Checklist for the main features of a bill.

1. What is the name on the bill?
2. What is the account number?
3. How much has to be paid?
4. Is anything owing from the previous bill?
5. If concession is available, how much discount would be deducted from this bill?
6. When was the bill issued?
7. When is the amount due?
8. Where and how could you pay this bill?
9. How long was there to pay it?
10. What period does this amount pay for?
11. When is the next bill due?
12. Is this a reasonable amount to pay? How could you check if you thought this bill was incorrect?
13. Who could you talk to if there are:
   • problems paying this bill on time.
   • concerns that the amount being charged is not correct.

Activity 3: Complaints processes

Discuss with the students about what to do if you had concerns about the amount charged. Refer to some sample bills and visit websites of the utility companies to see how you can question what is being charged or make complaints. It would be worthwhile to view the website of the Energy and Water Ombudsman of Victoria (EWOV) at www.ewov.com.au.

Take note of the knowledge and understanding of the students and decide whether the students’ awareness of the processes is adequate or needs input. You may need to invite guest speakers to talk to the students. See Additional Resources.
Sharing the bill

Aims and overview
The aim of this section is to assist students to become proficient in calculations involved in sharing bills.

Key concepts
- Dividing a given amount in a given ratio, using mental, written and calculator techniques.
- Ratios, percentages and fractions.
- Use of approximations and mental calculation as a means of checking the reasonableness of answers.

Activity 1: Sharing food bills
Bring in some sample restaurant menus. Take-away restaurant menus are fine. Then set up scenarios and questions dealing with possible sharing of a bill. Discuss the maths required to estimate and/or calculate the total bill if a group of people want to share the costs.

After working through one or two as examples, you could ask students to work in small groups with two or three other sample menus and undertake these tasks:
- Choose what they would eat at each restaurant if they went to the restaurant for a meal
- Calculate the total bill
- Work out how much it would cost each person if they shared the bill equally.

Activity 2: Dividing a bill pro-rata
A discussion could centre round the justifications underlying paying a ‘pro-rata’ amount of a bill (e.g. housemates that do not use the landline telephone equally, people that eat and drink more than others etc). Discuss when would it be OK to share evenly and when a different ratio should be negotiated?

Explain that understanding and using ratios, percentages and fractions will help in dividing bills whether dining out, splitting a phone bill or sharing an electricity account.

Demonstrate that some ratios are easier than others to work out, but the process is the same. For example, if a restaurant bill of $160 was to be shared among three people in the ratio of 4 parts to 3 parts to 1 part (written as 4:3:1) then we can take the following steps:

Note: You can rewrite these with more words and less symbols or vice versa depending on the needs and maths experience of the students.
- Add up the numbers of the ratio parts (4+3+1)
- Note this total (= 8 parts).
- Divide the amount to be shared by this total value ($160 divided by 8 = $20). This gives the value of each part.
- Work out each share by multiplying the part value by the parts per person/share.(i.e. $20 x 4 then $20 x 3 and then $20 x 1)
- The final share values are $80 : $60 : $20
- You check this by adding the share amounts and seeing if it equals the total of the bill (i.e. 80+60+20= 160)

Activity 3: A Fair Split in a Shared House
After modelling one or two examples in class, practice will instil confidence with the maths involved in dealing with ratio /proportion. Refer to Worksheet D2. Activity 3: A fair split in a shared house.
Activity 3: A fair split in a shared house

1. Housemates Sophie, Tim and Nick go to a restaurant for dinner. The total bill was $175.00, but one of them did not eat as much or drink as much as the other two. So the friends decide to share the bill in the ratio of 2 parts to 2 parts to 1 part. How much did each person pay?

2. Sophie, Tim and Nick agree to share the costs in proportion to the amounts charged on the phone calls they each make. The next quarterly bill was for a total of $207.50. Do the calculations to determine how the $207.50 bill should be shared, if the bill was made up of:
   - ‘Service and equipment’ = $75
   - Sophie’s call charges = $54.25
   - Tim’s call charges = $23.45
   - Nick’s call charges = $54.80.

3. Sophie, Tim and Nick spent a total of $78.50 on a party. They invited Sophie’s brother, Tim’s two sisters, three of Nick’s friends and another three people who were friends of both Sophie and Tim. Present the arguments and do the calculations to determine how the bill should be split based on the assumption that each host was paying for themselves and their friends.

4. An electricity bill of $280.65 has just arrived. It covers the period 20th April to 29th July and includes the statement ‘The electricity cost per day is $2.80.’ How much of the bill should Sophie, Tim and Nick each pay, given that Nick did not move into the house until 1st June?

5. Estimate the answers to the following problems. Say whether the estimates are likely to be less than or greater than the exact answer.
   - Divide $177.95 in the ratio 1:8
   - Divide $177.95 in the ratio 4:5
   - Divide $110 in the ratio 1:3:6
   - Divide $249.90 in the ratio 1:3:6
   - Divide $240 in the ratio 1:2:3
   - Divide $189 in the ratio 1:2:3:4
Home phone bill

Aims and overview

The aim of this section is to become proficient in calculations related to phone calls.

Key concepts

- Variable charges (Usage charges) as distinct from fixed charges (Services/Equipment).
- Per call and per minute rates.
- Cost factors in accounts for home telephones.
- Linear algebra to investigate and compare alternatives.

Activity 1: At what cost talking?

Using a sample bill you have collected, with the real name and address not visible and/or replaced by a fictitious one, guide the class through finding the main features of a home phone bill. Then using the bill, fill in the following summary table on the board. Discuss your findings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Percentage of Total Bill (Item Cost ÷ Total Cost) x100 = %</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calls - local</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calls -STD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calls to mobiles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calls to 1300 numbers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calls other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line rental/network access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL COST ON BILL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activity 2: Home phone bills

Introduce to students that the use of their home phone is just one way they may be able to cut costs and manage their spending better. Tell them they might be surprised how much money they can save over one year if they can put in some sensible limits. Ask what some of these limits might be? Ask students to complete the worksheet: D3. Activity 2: Talk time.
Activity 3: A challenge

After completing the worksheet, D3. Activity 2: Talk time, raise the question ‘Which plan would be cheaper if the only calls that were made were calls to ‘same company’ mobiles?’

Students may be able to solve this question by ‘guess and check’ but explain that it also provides a challenge to use skills in algebra and/or graphs or Excel spreadsheet.

The challenge is to develop the two cost functions (simultaneous equations):
\[
\text{CA} = 23.5 + 0.33n \quad \text{and} \\
\text{CB} = 17.5 + 0.37n
\]

You can demonstrate how to use algebra and/or graphs (using Excel if appropriate) to solve the simultaneous equations and show that:
\[
\text{CB} < \text{CA} \quad \text{for} \quad n < 150.
\]

Similarly, algebra may be used to analyse the plans A and B in Worksheet D3. Activity 2: Talk time. For example, under what circumstances would the Plan B bill be cheaper if the only calls made were local calls? This can be solved by algebra, where variable \( n \) is the number of local calls for the plans to have the same monthly bill. Ask students if they can write down and solve the equations involved?

Activity 4: Your home phone

The aim is to familiarise students with their own home phone bill and to analyse it to see if they could make it cheaper. Students need to bring in copies of a home phone bill. You may need to provide anonymous samples for those students who cannot bring in their own bills.

- Calculate what your bill would have cost if it had been calculated under Plan A of worksheet: D3. Activity 2: Talk time.
- Calculate the average per call cost of your calls to mobiles.
- What percentage of the total bill is for Usage charges and what percentage is for Service and Equipment?
- Calculate the average cost of a phone call, including costs for Service and Equipment.
- Write down some suggestions of how your family could save money on phone calls.
- Which way does your family choose to pay the phone bill? Why?
Activity 2: Talk time

Monitoring the use of your home phone is just one way you may be able to cut costs and manage your spending better. You will be surprised how much money you can save over one year if you can put in some sensible limits.

The tables below show two different home phone plans for the same amount of use over a period of one month. Calculate the monthly charge for each plan.

<table>
<thead>
<tr>
<th>Plan A</th>
<th>New price</th>
<th>Usage one month</th>
<th>Cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locals calls</td>
<td>20c per call</td>
<td>125 calls</td>
<td></td>
</tr>
<tr>
<td>Capped STD calls</td>
<td>$2.25 per call between 7pm (4pm Sat) and midnight</td>
<td>18 calls</td>
<td></td>
</tr>
<tr>
<td>Capped calls to same company mobiles</td>
<td>$2.25 per call between 7pm (4pm Sat) and midnight</td>
<td>4 calls</td>
<td></td>
</tr>
<tr>
<td>Calls to same company mobiles</td>
<td>33c /min (24 hrs, 7 days a week)</td>
<td>40 min</td>
<td></td>
</tr>
<tr>
<td>Calls to other company mobiles</td>
<td>37c /min (24 hrs, 7 days a week)</td>
<td>35 min</td>
<td></td>
</tr>
<tr>
<td>Monthly line rental</td>
<td>$23.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost per month</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan B</th>
<th>New price</th>
<th>Usage one month</th>
<th>Cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locals calls</td>
<td>30c per call</td>
<td>125 calls</td>
<td></td>
</tr>
<tr>
<td>Capped STD calls</td>
<td>$3.00 per call between 7pm (4pm Sat) and midnight</td>
<td>18 calls</td>
<td></td>
</tr>
<tr>
<td>Capped calls to same company mobiles</td>
<td>$3.00 per call between 7pm (4pm Sat) and midnight</td>
<td>4 calls</td>
<td></td>
</tr>
<tr>
<td>Calls to same company mobiles</td>
<td>37c /min (24 hrs, 7 days a week)</td>
<td>40 min</td>
<td></td>
</tr>
<tr>
<td>Calls to other company mobiles</td>
<td>42c /min (24 hrs, 7 days a week)</td>
<td>35 min</td>
<td></td>
</tr>
<tr>
<td>Monthly line rental</td>
<td>$17.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost per month</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answer the following questions:

1. Comment on the two Plans.
2. Who do you think should use Plan A and who should use Plan B?
3. Under what circumstances would the Plan B bill be cheaper if the only calls made were local calls? What then would be the price per call?
4. Which Plan would suit you most? Why?
Mobile phone bill

Aims and overview

The aim of this section is to learn how to interpret, calculate and compare pricing plans for different mobile phone plans.

Key concepts

- Per call rates, per minute rates.
- Variable charges (Usage charges) as distinct from fixed charges (Services/Equipment).
- Estimation and calculation skills involved in these particular bills.
- Basic services provided by plan providers.

Activity 1: What type of phone?

Ask if students have mobile phones. Suggest that they could prepare a short description of their mobile phone, whether their phone has a Pre Paid account or a Plan account and write up some notes about their usage levels. They could then do a short talk/presentation to the class using those notes to help them. A sample report card is provided opposite.
Mobile phone bill

Sample report card D 4. Activity 1: Portrait of My Mobile

Make: ..........................................................................
Type: ..........................................................................
Facilities: ..........................................................................
Best feature: ..........................................................................
Most disappointing thing: ..........................................................
How long I spend on the phone each day:
  • Talking ..........................................................................
  • Texting ..........................................................................
  • Playing games ..........................................................................
  • Taking photos ..........................................................................

Choosing a Plan or Pre Paid

  • What are the difficulties in deciding between a Plan and Pre Paid?
  • What sources of assistance did you seek to make your decision between a Plan and a Pre Paid?
  • What was the final deciding factor in choosing between a Plan and a Pre Paid?

Activity 2: Survey of mobile phone usage.

Now that students have prepared short descriptions of their mobile phone usage, suggest that they undertake a survey of other students in the school. Ask students to list the features they would want to know and frame these into questions for the survey. Get students to agree on the set of questions that they are asking the same questions. In small groups, they should then ask different groups of students (so they end up with mutually exclusive sets of students). A sample set of questions follows.

When the surveys are completed, ask students to collate the data into tables and plot some graphs. Then ask each group to report to the whole class. Discuss the findings as a group.
Sample survey D 4. Activity 2: Survey of mobile phone usage

This survey aims to find out, first hand, the who, which, why, where, and when of mobile phone usage in our locality.

1. Age: _______________
2. Gender: Male ☐ Female ☐
3. Have you got a mobile phone? Yes ☐ No ☐
4. Who uses the mobile? _____________________________________________
5. Who pays the bill? _______________________________________________
6. How often do you use the mobile each day? ___________________________
7. Which facilities do you have? _______________________________________
   (a) Which ones do you use? _________________________________________
   (b) Which one would you use most? _________________________________
8. Which supplier do you use? _________________________________________
   (a) Why did you choose this supplier? _______________________________
9. Are you signed up to a plan? Yes ☐ No ☐ If No, go to Q.10
   (a) Which plan? _________________________________________________
   (b) Are you happy with this plan? Yes ☐ No ☐
10. (a) What did your Pre Paid mobile phone cost? _______________________
    (b) What is your normal monthly Pre Paid expense? __________________
11. How has using the mobile changed the way you live? ___________________
    (a) Benefits? __________________________________________________________________
    (b) Problems? __________________________________________________________________

THANK YOU FOR YOUR PARTICIPATION.
Mobile phone bill

Activity 3: At what cost my precious phone?

Using a sample bill you have collected, with real name and address not visible and/or replaced by a fictitious one, guide the class through finding the main features of a mobile phone bill. Then using the bill fill in the following summary table on the board. Discuss your findings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Percentage of Total Bill (Item Cost ÷ Total Cost) x100= %</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILE CALLS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Calls (peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Calls (off peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Voice mail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMS - Text Messaging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMS - Multi Media Messaging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATA CHARGES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RENTAL/MONTHLY PAYMENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL COST ON BILL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activity 4: Being Phone Smart

How can mobile phone users keep their costs down? Make a class list of tips that could be used to assist others.

Accessing some key websites will assist students in compiling their list of key tips or messages about being mobile phone smart. These include:

- Australian Media and Communications Authority website [www.acma.gov.au](http://www.acma.gov.au)

Extension: Is your Plan the best choice available?

Using either the Bill Estimator or the Bill Calculator, students can use the Phone choice website ([www.phonechoice.com.au/index.cfm?Section=Mobile](http://www.phonechoice.com.au/index.cfm?Section=Mobile)) to conduct their own personal research. The aim will be to find the cheapest mobile phone Plan for either an average user, or else the cheapest Plan based on their own person phone bill.
Internet costs and bills

Aims and overview

The aim of this section is to learn about internet access and plans, and how to interpret, calculate and compare pricing plans for internet provider services.

Key concepts

• Internet supply plan details.
• Download rates.
• Estimation and calculation skills related to internet provision and services.

Activity 1: What type of internet plan?

Ask if students have internet access. Suggest that they could prepare a short description of their Internet experience and write down some notes. They could then do a short talk/presentation to the class using those notes to help them. A sample report card is provided - Sample card D5. Activity: My Net. Explain and discuss specific terms related to Internet access such as download speed, ADSL, etc.

Activity 2: Survey of internet usage.

Now that students have prepared short descriptions of their internet usage, suggest a survey and ask students to list the type of things they would want to know and frame these into questions for a survey. Get students to agree on the set of questions so that they are asking the same questions. In small groups, they should then ask different groups of students. This well ensure a mutually exclusive sets of students. A sample set of questions is shown in - Sample survey D5. Activity 2: Survey of internet usage. After the data has been collected, ask students to collate the data into tables, plot graphs, then ask each group to report back to the whole class. Discuss the findings as a group.

Activity 3: At what cost my net?

Using a sample internet provider bill, guide the class through finding the main costs of internet usage.

How can internet users keep their costs down? Make a class list of tips that could be used to assist others.

Activity 4: What Provider? What plan?

Students could do some research into different plans and costs. They will need to have access to the internet. The following web site appears to give a good selection: http://bc.whirlpool.net.au/

Other internet plan websites that also offer some choices are:


Internet costs and bills

Sample card D5. Activity 1: My Net

Type of internet access: ....................................................
Which provider do you use? ....................................................
Why did you choose this provider? ....................................................
Speed and download allowances: ....................................................
Best feature: ..........................................................................
Best feature: ..........................................................................
Most disappointing feature: ....................................................

How long I spend on the net each day:
• Talking ..........................................................................
• Face book/ Twitter ..............................................................
• My blog ..........................................................................
• Research: (e.g. items to buy, school work) ..............................................................
• Downloading ..........................................................................

Choosing a Plan:
• What are the difficulties in deciding which net plan to get?
..............................................................................................
• What sources of assistance did you find?
..............................................................................................
• What was the final deciding factor in choosing your Inernet plan?
..............................................................................................
Internet costs and bills

Sample survey D5. Activity 2: Survey of internet usage

This survey aims to find out, first hand, the who, which, why, where, and when people use the internet in our locality.

1. Age: _______________
2. Gender: Male ☐ Female ☐
3. Do you have access to the internet at home? Yes ☐ No ☐
4. Who uses the internet? ________________________________
5. Who pays the bill? ________________________________
6. How many times a day do you use the internet each day? ________________________________
7. Which features and services do you? ________________________________
   (a) Talking ☐
   (b) Phone ☐
   (c) Email ☐
   (d) Face book/ Twitter ☐
   (e) Research (e.g. school work, personal material) ☐
   (f) Buy things (online purchasing e.g. eBay) ☐
   (g) Downloading (e.g. movies, music, TV series) ☐
   (h) Other ☐
8. Which one would you use most? ________________________________
9. Which ISP do you use? ________________________________
   (a) Why did you choose this ISP? ________________________________
   (b) What plan are you on? ________________________________
   (c) Are you happy with this plan? ________________________________
10. How has using the internet changed the way you live? ________________________________
    (a) Benefits? ________________________________
    (b) Problems? ________________________________

THANK YOU FOR YOUR PARTICIPATION.
Water bills

Aims and overview

The aim of this section is that students will apply skills in estimation and calculation using rates and ratios within the context of water use and costs.

Key concepts

- ratio, cost rates (per kilolitre), flow rates (litres per minute),
- fixed charges and variable charges,
- Net Annual Value (NAV).

Activity 1: Turn off that tap!

Introduce our water management issues; global warming, less water catchment, increased population, sustainable consumption and others. Discuss permanent water restrictions in most Australian cities and lead into the idea of an investigation into water wastage.

Students choose an item such as a tap or a hose or a shower head. Their task is to run tests on the amount of water used if one of the following was to happen:

1. The tap is left dripping for an afternoon
2. The hose is accidentally left on overnight
3. A person takes a 5 min shower.

The calculations should be set out and the methods of estimation should be explained.

Students can then apply this preliminary testing to undertake a more extensive investigation as detailed in Worksheet D6. Activity 1: To waste or not to waste.

Get students to suggest ways of saving water in a household as an extension to this task. The Our Water Our Future website (www.ourwatervic.gov.au) will assist students with this task.
Activity 1: To waste or not to waste?

Working with a partner, your task is to estimate the annual amount and cost of water used by the Sophie, Tim and Nick household.

1. One person should calculate for a house with modern water-saving facilities, and no dripping taps, and a garden watered by grey water from the washing machine.
2. The other person should calculate for a house with older, more wasteful facilities, one dripping tap
3. Research and estimate the amounts used by Sophie, Tim and Nick and fill in the following tables, by agreement with your partner.

<table>
<thead>
<tr>
<th>Water use</th>
<th>Average Amount used each time (litres)</th>
<th>Average Amount used per year per person (litres)</th>
<th>Average Amount used per year (litres) for household of three persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub (1/2 to 3/4 full)</td>
<td>150 litres per time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average shower new AAA style</td>
<td>7 litres per min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet modern full flush</td>
<td>6 litres per flush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet modern half flush</td>
<td>3 litres per flush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front loaded washing machine new AAAA style</td>
<td>40 litres per load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic dishwasher</td>
<td>35 litres per load</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 1: To waste or not to waste?

### House B. Older, wasteful facilities

<table>
<thead>
<tr>
<th>Water use</th>
<th>Average Amount used each time (litres)</th>
<th>Average Amount used per year per person (litres)</th>
<th>Average Amount used per year (litres) household of three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub (1/2 to 3/4 full)</td>
<td>150 litres per time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average shower old style</td>
<td>15 litres per min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet old single flush only</td>
<td>11 litres per flush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older top-loading washing machine</td>
<td>120 litres per load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic dishwasher</td>
<td>35 litres per load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dripping tap</td>
<td>22 litres per day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compare your answers for the two different houses. What is the difference in water usage over a year? See if you can find out the cost of water and use it to estimate the difference in annual costs between the two houses.

### Extensions: Online calculators

There are a number of water use calculators available online. You could visit some of these sites and answer a number of simple questions regarding the size of your household, type of water using appliances and the way you use water around your home. The calculator provides a summary of your water use based on your responses and offer solutions to help you reduce water usage. Here are some examples:

Youth Credit and Debt - Introduction

Aims and overview

In this section, students will:

• investigate different types of debt and identify the kinds of debt that are most likely to affect young people. Students will also identify the knowledge and skills they will need to make informed choices about avoiding going into debt

• apply skills in calculating with money and percentages in order to understand the rules involved in credit card calculations

• use spreadsheets to calculate simple and compound interest calculations, and apply these to evaluate different types of loans.

• consider the financial issues related to buying a car, evaluate different options for borrowing money to pay for a car and develop the skills to calculate interest on loans.

Key maths concepts

• percentages
• multiplying and dividing percentages, daily rates and annual rates
• reading credit statements
• simple interest (flat or fixed rate) and compound interest (reducing balance or effective rate)
• decimal equivalents
• using spreadsheets

Learning outcomes

At the end of this unit, students should be able to:

• discuss the advantages and disadvantages of using credit to purchase goods and services.

Links to other Consumer Stuff resources

Commerce Resource – Section E

Useful resources

Budget planners, bank brochures, Consumer Affairs Victoria (CAV) fact sheets on credit, bank websites for interest rate calculators.

Visit the Australian Securities and Investments Commission (ASIC) website. ASIC is the chief regulator for all credit matters in Australia. The http://www.moneysmart.gov.au/ site provides a range of very useful information on credit issues affecting young people.
Youth Credit and Debt - Introduction

Background information

Young consumers face considerable pressures to consume, and to consume now, rather than later. Young people have more spending power than previous generations: the average 14-15 year old has income of over $60 a week and this amount trebles for a 16-17 year old. Once they turn 18, young people often have easy access to credit, in the form of credit cards, store cards and personal loans. Over 90% of 14-20 year olds have a mobile phone, and phone bills are a major source of financial difficulty and debt.

Recent research suggests that young Australians need to improve their financial literacy in order to manage a range of costs, including higher education, housing and transport. Learning how to manage money has never been more important!

Recognising scams is also an important skill for young people to develop. In 2007, 1.3 million Victorians were exposed to scams. Of these, 87,500 fell victim to a scam, costing over $150 million.

Activities and worksheets

E1: Into debt or not?
E2: Using credit cards wisely
E3: Buying on terms
E4: Interesting calculations
E5: Cars cost
## Into Debt or not

### Aims and overview

In this lesson, students will investigate different types of debt and identify the kinds of debt that are most likely to affect young people. Students will also identify the knowledge and skills they will need to make informed choices about going into debt.

### Key Maths Concepts

- Percentages
- Calculating interest
- Operations

### Preparation

Teachers will need to provide students with worksheets. They will also need to provide students with teaching materials in skill areas that students have identified that they need further work in (See Activity 1).

### Activity 1: Debt

Using the Consumer Affairs Victoria Website http://www.consumervic.gov.au and http://www.moneyhelp.org.au, students complete the credit and debt table in Worksheet E1. Activity 1: Into Debt or Not that includes:

- different ways that people can go into debt e.g. bills, credit, loans, mobile phones, gambling.
- who can provide credit.
- what are different types of credit/loans usually used for? For example, mortgage – buying a house.
- which types of credit have the highest interest rates and what other fees are associated with using credit.

Discuss students’ findings and conduct a class PMI (plus, minus, interesting) to brainstorm the positives, negatives and interesting points about debt.

Ask students to reflect on what maths skills they feel they could need and/or improve on to better understand the positives and negatives of using different types of credit.

### Activity 2: Cash crunch

Students read the article ‘Young vulnerable to credit traps’ and complete Worksheet E1. Activity 2: Into Debt or not: Cash Crunch.

Students also complete activity E5 ‘Mobile phone debt’ in the Consumer Stuff Commerce resource.

Facilitate discussion using the following questions:

- What types of debt are young people most likely to encounter?
- Why do young people sometimes have problems with debt?
- Is debt always bad?
- How can interest affect paying off debt?
- What can help young people to make informed choices about going into debt?
Activity 3: Scams

Working in small groups, students investigate a scam from the list on the Consumer Affairs Victoria website http://www.consumervic.gov.au. They complete Worksheet E1. Activity 3: Into Debt or not: Scams and prepare a report to the class.

Facilitate discussion using the following questions:

- How can you tell when someone is trying to scam you?
- What are some strategies to avoid being scammed?
- What maths and other skills are required to help avoid being scammed?

Another suitable website to visit to assist students to compete this research is http://www.fido.gov.au/ which is the Fido consumer web site at the Australian Securities and Investments Commission (ASIC). This site also contains the Pie in the Sky awards for the most outrageous scams.

Extensions/Applications

Students find sources of information that will assist them in gaining the skills that they identified through self reflection to better understand debt and credit e.g. websites, books, and interactive materials explaining maths concepts.
### Activity 1: Into Debt or not - Credit

<table>
<thead>
<tr>
<th>Type of credit/debt</th>
<th>Who charges/lends the money?</th>
<th>What's it usually used for?</th>
<th>How much can you borrow?</th>
<th>What's the interest rate?</th>
<th>Are there other fees involved?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit card</td>
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<tr>
<td>Store card</td>
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<tr>
<td>Interest free loan</td>
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<tr>
<td>Bills (e.g. mobile phone, medical)</td>
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<td>Personal loan</td>
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<tr>
<td>Borrowing from family and friends</td>
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<td>Other........</td>
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</tbody>
</table>
Activity 2: Into Debt or not - Cash Crunch

CASH CRUNCH
Young vulnerable to credit traps.

ANTHONY KEANE, MONEY EDITOR
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Just like the embattled corporate sector, debt is likely to be the biggest financial issue facing young Australian adults this year.

Despite falling interest rates, the costs of credit cards and store cards remain high and the potential for debt problems among young people is greater than ever before.

Recent research by debt collection company Dun & Bradstreet found that more than half of Australia’s debt defaulters were aged under 34. The majority of defaults were for amounts less than $400, it found.

AMP financial planner Mark Haynes said a default normally stayed on a person’s credit report for five years.

“This can have serious consequences as lenders usually check a person’s credit report when they apply for credit, such as for a mortgage or personal loan,” he said.

“Existing defaults might not be deleted - even if they pay off the debt, they’ll only be marked as paid, and a lender may still decline their loan application.”

Mr Haynes said credit cards were easy to access and were often being used to underwrite active lifestyles.

Financial Planning Association SA chapter chair Kerrin Falconer said if young people could not manage their credit cards and store cards, they should cut them up and only use cash.

“If you don’t pay off the full amount each month, you are paying interest on the interest on the interest,” she said.

“Home loan interest rates may have come down, but credit card interest rates haven’t and they are around a hefty 20 per cent, depending on which card you have.”

Ms Falconer said mobile phone debts could easily get out of control.

“Watch your consumption and get it under control,” she said.

“Make sure you read mobile phone contracts, or indeed any other contracts you take out. The fine print which may involve balloon payments for such things as car leases can often be a killer.”

AMP’s Mr Haynes said swapping to a pre-paid mobile phone contract was a good strategy for people feeling the strain of mobile phone debt.

He said another strategy to fight credit card and store card debt was to transfer the balance to a new provider who offered low or zero interest rates.

Activity 2: Into Debt or not - Cash Crunch

Questions:

• What advice does the AMP give for getting debt under control?
• What is a good strategy for reducing mobile phone debt?
• Why do you think young people can have difficulty with debt?
• What do you think is meant by this statement about paying off credit card debt?
  "If you don’t pay off the full amount each month, you are paying interest on the interest on the interest"
• Can you give an example of how this might happen?
Activity 3: Into Debt or not - Scams

A scam is a scheme designed to take your money dishonestly or deceitfully, and give you little or nothing in return.

Some scams are hard to pick and some con men are hard to recognise (they don’t all wear cheap suits and dark sunglasses). In fact, in 2007 alone, 87,500 Victorians fell victim to scams and lost over $250 Million.

Investigate a type of scam from the list on the Consumer Affairs Victoria website. http://www.consumervic.gov.au

Complete the table below to help you prepare a presentation about the scam you chose. You may also like to use other sources of information such as http://www.scamwatch.gov.au or ‘The Little Black Book of Scams’ on the Australian Competition and Consumer Commission website. http://www.accc.gov.au.

<table>
<thead>
<tr>
<th>Type of Scam</th>
<th>Where is the scam carried out? e.g. online, letter, phone, email, fax etc.</th>
<th>Who does the scam target?</th>
<th>How does the scammer deceive the victim?</th>
<th>What can people do to avoid the scam?</th>
<th>Other important information</th>
</tr>
</thead>
</table>


Using Credit Cards Wisely

Aims and overview
In this section students will apply skills in calculating with money and percentages in order to understand the rules involved in credit card calculations.

Students will also investigate and evaluate the different features that various credit cards offer.

Key Maths Concepts
- percentages of an amount, multiplying and dividing percentages, ratio, daily rates and annual rates
- opening balance, closing balance, minimum amount due, credit limit, available credit and due date.

Preparation
Teachers will need to provide students with worksheets.

Activity 1: Credit and debit cards
Facilitate discussion about credit cards using the following questions:
- What are the positives and negatives of buying items with a credit card compared to using a debit card?
- How do credit cards compare with other types of loans?
- Why do some people get into financial trouble using credit cards?
- What maths skills are necessary to manage the use of credit cards?

Students complete Worksheet E2. Activity 1: Using Credit Cards Wisely.

Discuss with students which credit cards are most suitable for different purposes e.g. keeping in case of emergencies, purchasing items that can be fully repaid every month, purchasing expensive items, and purchasing lots of items interest.

Activity 2: Credit card statements
Students interpret the credit card statement in Worksheet E2. Activity 2: Using Credit Card wisely, and complete the questions. Discuss what 'Available Credit' means. Ask students to investigate how the daily rate is calculated and how these figures are related to other figures in the statement. Encourage mental calculation and approximation, particularly as a strategy for checking solutions.

Extensions/Applications
Students must explain their answers to the first three questions by justifying their approximations and mental calculations in support of calculated values.
Activity 1: Using Credit Cards Wisely

Credit cards have different features and payment options. Find out about the differences in what different credit cards offer and fill in the table below.

<table>
<thead>
<tr>
<th>Name of Credit Card</th>
<th>Issuer</th>
<th>Interest Rate</th>
<th>Other fees</th>
<th>Minimum monthly payment</th>
<th>Features e.g. interest free period, rewards program</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Using your research on different credit cards, answer the following questions. Give reasons for your answers.

Which credit card would be best for:

- keeping in case of emergencies?
- purchasing items that can be fully repaid every month?
- purchasing expensive items?
- purchasing lots of items?
Activity 2: Using Credit Cards Wisely

**The Bank**

MR TYE MILLER
98 STRANGE STREET
FOOTSCRAY VIC 3011

**CREDIT CARD STATEMENT**

<table>
<thead>
<tr>
<th>Date</th>
<th>Reference number</th>
<th>Transaction details</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 April</td>
<td>DSJS79303YU77E339</td>
<td>Pizza Palace Footscray</td>
<td>$26.50</td>
</tr>
<tr>
<td>13 April</td>
<td>DJDD3363G3BE8BH</td>
<td>Goodbuy Supermarket</td>
<td>$61.10</td>
</tr>
<tr>
<td>14 April</td>
<td>87657454357G55VZ</td>
<td>Payment Received Thank you</td>
<td>$144.35</td>
</tr>
<tr>
<td>17 April</td>
<td>7364648NCJHBD77</td>
<td>Cinema Online 1134</td>
<td>$22.00</td>
</tr>
<tr>
<td>22 April</td>
<td>XDBSW86464HFWS</td>
<td>World of Wheels Island Park</td>
<td>$57.50</td>
</tr>
<tr>
<td>24 April</td>
<td>DJDD3363G3AD7CI</td>
<td>Pizza Palace Footscray</td>
<td>$19.90</td>
</tr>
<tr>
<td>28 April</td>
<td>T673Y3D829294754T</td>
<td>Goodbuy Supermarket</td>
<td>$54.43</td>
</tr>
<tr>
<td>01 May</td>
<td>93457223VDJCFSERJ</td>
<td>Pizza Palace Footscray</td>
<td>$19.90</td>
</tr>
<tr>
<td>03 May</td>
<td>4554437437BDJDTQI</td>
<td>FID Government Duty</td>
<td>$0.70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit limit</th>
<th>Available credit</th>
<th>Annual rate</th>
<th>Daily rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2000</td>
<td>$1737.97</td>
<td>16.05%</td>
<td>0.04397%</td>
</tr>
</tbody>
</table>

**Statement issued** 4 May 2010
**Account Number** 9867 2347 0987 628
**Closing balance** $262.03
**Payment due date** 29 May 2010
**Minimum amount due** $25.00
Activity 2: Using Credit Cards Wisely

1. Use Tye Miller’s credit card statement to answer the following questions.
   
a. Did Tye owe any money on his credit card at the beginning of this statement?
   
b. What is the total purchase amount in the period shown?
   
c. What is the total Tye had to pay by the due date to avoid any credit charges?

2. Tye paid only the minimum amount due and spent $230 in the next month. He also had a government charge of $0.73.
   
a. How much interest was Tye charged in the next statement issued on 5 June? (Tye’s account attracts interest from the statement’s issue date for any amount not paid by the due date.) Show your calculations.
   
b. What was the closing balance for the next statement?

3. On Tye’s card, cash advances do not have an interest-free period. Despite this, he takes out a $100 cash advance on 7 June.
   
a. How much interest will he eventually be charged on this $100, if his next payment, made on the due date of 29 August, is for the total amount owing?
Buying on terms

Aims and overview
The aim of this section is to explore the convenience and pitfalls of buying on terms.

Key concepts
Comparison and base line

Activity 1: On what terms?
Use supermarket/department store catalogues as references or go to some on line advertisements.
Ask the class to name something they want to buy but cannot afford to pay cash for now. Have they ever bought on terms?
• Role play a situation where you buy something worth $500 on terms.
• Get some examples of the different wordings or different ways of saying the same thing.
• Set up examples where the terms appear easy (e.g. repayments $1 per week) then tease out the pitfalls such as long payback periods etc

Activity 2: Buying a computer
Jenny wants to buy her own computer. Jenny wants to spend about $1800 for the computer, but she has only $200 saved up. She researches her options and the following is what she comes up with:
• ‘Steady Betty’ finance company offers a $1600 loan at 22% fixed interest per annum.
• Her family has a store card with 14% per annum interest and the family are prepared to help.
• Her bank offers her a credit card with a $2000 upper limit and a 60 day interest free period if the balance is paid in full each month.

What sort of things should Jenny consider while deciding which option to go for e.g. what can she afford each month?

Which option would you chose? Why?

Activity 3: Buying on terms
Students to complete Worksheet E3. Activity 3: Buying on terms. This worksheet highlights the different methods for buying a television.
Activity 3: Buying on terms

The “Y-BUY” Television Company
“Buy the way that suits your pay”

The TV you want is $799!

$799

PLAN 1
CASH PLAN
Pay just $699 full price and save $100.

PLAN 2
RENT AND BUY
Rent for $40 per month for one year, and we refund 1/2 the purchase price when you decide to buy.

PLAN 3
NO DEPOSIT PLAN
Pay only $50 per month for two years.

PLAN 4
LOW REPAYMENT PLAN
Pay only $10 deposit, and a low $2.50 per week for 360 weeks

- At a glance, which plan would sound the easiest to deal with?
- How would you choose to buy the TV?
- Calculate the cost of the TV under each plan?
- Which is the most expensive plan?
- What is the cheapest plan?
- How much more than the cash price (i.e. interest) do you pay with plans 2, 3 and 4?
- What is the interest rate charged on plans 2, 3 and 4 (i.e. interest as a percentage of the cash price)?
Interesting Calculations

Aims and overview
In this lesson, students will use spreadsheets to calculate simple and compound interest calculations. They will apply these to evaluate different types of loans.

Key Maths Concepts
- Simple interest (flat or fixed rate) and compound interest (reducing balance or effective rate)
- Percentages
- Decimal equivalents
- Spreadsheets

Preparation
Teachers will need to provide students with worksheets and access to computers with Excel or similar software. Copies of the worksheet ‘E4 - Paying off the card’ in the ConsumerStuff Commerce resource are required.

The Consumer Stuff teacher resources can be viewed, downloaded and/or ordered from www.consumervic.gov.au/consumerstuff/Resources for secondary teachers. Hard copies can also be ordered by email: consumerstuff@justice.vic.gov.au

Activity 1: Calculating interest
Model for students how to calculate interest on an amount over time e.g. $150 at 19% over 60 days
Students complete Worksheet E4. Activity 1: Calculating interest.

Give students worksheet ‘E4 - Paying off the card’ in the ConsumerStuff Commerce resource. Ask students to work out strategies for calculating how long it would to pay off the loan specified on the worksheet. Discuss different strategies that students have used.

Discuss with students, in light of their calculations, what potential dangers they can see in using credit cards.

Activity 2: Using spreadsheets
Introduce how formulas can be used in spreadsheets to perform calculations over time. Students complete Worksheet E4. Activity 2: Using a spreadsheet.

Discuss the different structures and formulas that students have used to set up their spreadsheet.

Activity 3: Case study
Students work in groups and choose an item (e.g. stereo, plane ticket, laptop, clothes etc) that they think would be common for young people to want to buy. They develop a case study, looking at different types of loans and payment methods for their chosen item and provide advice to young people who may want to take out a loan. Students can use spreadsheets and online credit calculators to compare interest repayments using various types of loans.

E4. Activity 3: Case Study will guide the students through this task.
Students present their case studies in the form of a poster, PowerPoint presentation, or website.

Extensions/Applications
Students investigate strategies for calculating compound interest without having to enter all the data into a spreadsheet.
Activity 1: Calculating interest

There are two main types of interest; simple interest (or flat or fixed rate interest) and compound interest (or reducing balance or effective rate interest). Simple interest is no longer used for consumer loans.

All consumer loans (housing, personal and credit card) are calculated on a compound interest rate. This means that the interest is paid on the amount still owing, not on the original amount borrowed. E.g. if your loan was for $500 but you have paid $250, you will only pay interest on $250.

Calculate the credit card interest charge on the following amounts:

- $250 for 45 days at a daily rate of 0.04452%.
- $350 from after 5th June until 8th August, at a daily rate of 0.04452%.

Calculate the bank interest charge on the same amounts:

- $250 for 45 days at an annual rate of 6%
- $350 from after 5th June until 8th August, at an annual rate of 8%.

If the minimum amount due on a credit card is either $25 or 2.5% of the closing balance, whichever is the greater:

- What is the minimum amount due on a Closing Balance of $1225.00?
- For what Closing Balance is the minimum amount due $25?

Calculate the compound interest on:

- $200 at 19.99% annual rate over 3 months if $30 is paid off each month. You may wish to use the table below to assist you.

<table>
<thead>
<tr>
<th>Month</th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (19.99%/12=1.67%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>$200.00</td>
<td>$30.00</td>
<td>$170.00</td>
<td>$2.84</td>
<td>172.84</td>
</tr>
<tr>
<td>Month 2</td>
<td>172.84</td>
<td>$30.00</td>
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<tr>
<td>Month 3</td>
<td></td>
<td>$30.00</td>
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</table>

Calculate the compound interest on $450. Assume a monthly repayment of $30.

- at 16.5% over 4 months.
- at 9.99% over 4 months.
- at 6.25% over 4 months.
Activity 2: Using a Spreadsheet

You can use a spreadsheet to calculate the compound interest to help you plan how you are going to repay a loan. In the example below, Miles bought a guitar for $999 using a credit card with an interest rate of 19.99% p.a. and paid back $100 a month. It took him 11 months for Miles to pay off the guitar and he paid $83.34 in interest.

<table>
<thead>
<tr>
<th>Month</th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (19.99%/12=1.67%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>$999</td>
<td>$100</td>
<td>$899</td>
<td>$15.0133</td>
<td>$914.0133</td>
</tr>
<tr>
<td>Month 2</td>
<td>$914.0133</td>
<td>$100</td>
<td>$814.0133</td>
<td>$13.594022</td>
<td>$827.60732</td>
</tr>
<tr>
<td>Month 3</td>
<td>$827.60732</td>
<td>$100</td>
<td>$727.60732</td>
<td>$12.151042</td>
<td>$739.75836</td>
</tr>
<tr>
<td>Month 4</td>
<td>$739.75836</td>
<td>$100</td>
<td>$639.75836</td>
<td>10.683965</td>
<td>$650.44232</td>
</tr>
<tr>
<td>Month 5</td>
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<td>Month 6</td>
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<td>Month 7</td>
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<td>Month 10</td>
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<tr>
<td>Month 11</td>
<td>$82.336451</td>
<td>$82.34</td>
<td>$0</td>
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<td>$0</td>
</tr>
</tbody>
</table>

- Create the spreadsheet required to complete the example above.

Set up a spreadsheet similar to the one above to answer the following questions:

- Jackie bought a $650 laptop with a credit card at 13.95%. She paid off $50 a month. How long did it take Jackie to pay off the laptop? How much interest did she pay?
- Angus bought an $268 iPod with a credit card at 16.5%. He paid it off at the minimum monthly fee of 2.5%. How long did it take Angus to pay off the credit card and how much interest did he pay?

Tips on using spreadsheets

To calculate a percentage enter the formula:
PRODUCT (cell number of amount to pay, interest rate /100 )
E.g. PRODUCT (E2,0.0167)

To add cells:
SUM (Cell1,Cell2,etc.)

There are also websites such as http://www.infochoice.com.au/calculators/credit-card-calculator/ which will calculate how long it will take to pay off a loan, taking into account the interest rate, fees and minimum monthly repayments.
Activity 3: Case Study

Write a case study that provides advice to people in your age group about buying an item using credit.

The item should be something that a young person would buy e.g. iPod, laptop, plane ticket, jeans, stereo etc.

Consider the following in your case study:

- Choose an item that is commonly bought by young people.
- Look at different prices of the item and choose an item that is within the budget of a young person.
- Look at different types of loans. E.g. Personal loan, credit card, store credit etc and provide advice on the best loan to take out.
- Consider the varied interest rates of different providers and the fees that go along with certain loans and cards.
- Consider different payment scenarios. E.g. If the person can only afford to pay back a small amount each month, or if they can afford to contribute a bit more to pay off the loan faster. This may alter your advice on the type of loan that they should take out.

When you are finished, present your case study to the class, providing advice to young people on taking out loans and using credit. You could support your presentation by using posters, electronic tools such as video, digital story, PowerPoint, Word or graphics.
Cars cost

Aims and overview
Student will consider the financial issues related to buying a car and evaluate different options for borrowing money to pay for a car.

Key Maths Concepts
- Interest rates
- Percentages

Activity 1: Hidden costs
Students investigate the hidden costs behind buying a car such as stamp duty and taxes, delivery fee or dealer charges, insurance, registration and transfer fees. You can use the activity called ‘Hidden Costs’ on pages 19-20 of Car Costs II: a numeracy workbook (Tout, 2007) as the basis for this work.

Activity 2: Buying a car
Ask students to work in groups to complete Worksheet E5. Activity 2: Cars Cost. Ask students to take on different roles: one student in charge of the spreadsheet, a second student in charge of a simple calculator and a third student armed with ‘pen and paper’. Students decide which tool would be best to find the answers to the problems on the worksheet.

Extensions/Applications
As support and extensions to the earlier work in Section C. Budgeting to balance income and expenses, you could ask students to investigate the different types of loans that can be used to buy a car and the different interest rates and fees that go along with them. Support material for this activity can be found on pages 23 to 24 in the section called ‘Loan repayments’ and Worksheet B: ‘Loan Calculations’ in Car Costs II (Tout, 2007).

References
Activity 2: Cars cost

Work with your group to prepare your answers and explanations to the following questions.

1. Nik wants to buy a car on terms, but his current budget only allows for monthly repayments of $250.00. The second hand car dealer has a policy that terms should be at 8% flat rate and should never extend beyond four years. Part of the sales pitch is that 8% is about the same rate as that currently quoted by the major banks.

   a. What size loans are within Nik’s budget?

   b. Nik believes the bank might be prepared to extend the personal loan up to $4,000.00. What financial advice would you give him?

   c. What other legal and technical details should Nik check before he signs any deal?

2. The following extract was taken from the Consumer Affairs Victoria website (www.consumer.vic.gov.au)

   If you buy goods, services or land now but agree to pay later and are charged extra for this, you are being provided with credit. All banks and other credit providers are now required to give consumers a clear idea of how much they’re really paying for their credit. This is called the comparison rate. It includes both the interest rate and the fees and charges, reduced to a single percentage figure.

   a. How could knowing about this requirement have assisted Nik in deciding which deal to accept?

3. Sophie has been offered $2,000.00 for her old car in a private sale and $2,500.00 as a trade in on a new car with a retail price of $20,500.00, including all on-road costs.

   a. Terms for paying for the new car would be 36 monthly instalments of $620.00. How much would she end up paying if the trade in value was used as deposit?

   b. Alternatively she could sell the old car privately for $2,000.00 and pay the additional $18,500.00 using a bank loan guaranteed by her sister Nina. The bank would charge 9% per annum interest, calculated monthly, and she could repay $620.00 per month until the loan was paid off. Would this be a better deal? Include calculations using either:

      • the approximate formulas, or
      • a spreadsheet, or
      • the Savings calculator on the web site www.choice.com.au. The direct URL is:

Measurement and packaging - Introduction

Aims and overview

This section looks at the role that measurement, space and shape play in relation to packaging of goods and products and how they are sold. It poses questions such as why are some products sold by weight while some are sold by volume. In relation to packaging, it poses questions related to the advantages and disadvantages to consumers of different types and styles of packaging. What do you get for your money? Are some ways of packaging and selling goods fairer than others? Is it cheaper to make your own product?

Key maths concepts

The metric measurement system and units relevant to packaged goods:

- The metric system of units focusing on mass and volume, including estimating and measuring quantities, abbreviations, conversions between units, and appropriate choices of units.
- Discussing the connection between weight and mass and volume and capacity.

Knowledge of properties of two dimensional and three dimensional shapes relevant to packaged goods:

- The words related to shapes such as straight, curved, square, rectangle, circle, triangle, sphere, cube, rectangular prism (box), cylinder.
- Where relevant, can use standard formulae to find volume and capacity of familiar objects (cubes, rectangular prisms and cylinders).

Number and quantity skills such as:

- Unit prices or price rates eg. dollars per kilogram, cents per 100gm.

Learning outcomes

At the end of this unit, students should be able to:

- Read and understand about different types of products (mass and volume), and to learn about quantities and how they are measured.
- Describe different styles and shapes of packaging, and what factors impact on packaging.
- Extend their understanding of value for money in relation to packaging of goods.
- Understand whether it is cheaper to make your own products/goods and why or why not.

Links to other Consumer Stuff resources

Health and Wellbeing resource – Section B
Consuming Planet Earth resource – Section C
Measurement and packaging - Introduction

Background information

In relation to measurement of goods, from July 2010 trade measurement became the responsibility of the National Measurement Institute (NMI), a division of the Department of Innovation, Industry, Science and Research in the Australian Government. NMI is responsible for maintaining the primary standards of measurement. Their website is:


There are different standards for different products in relation to the acceptable quantities in a product, and these are all based on different sampling processes. In a number of cases the shortfall provisions have stipulated that a deficiency from the quantity stated on the label should not exceed more than 5 per cent in any one package or that there can be no average deficiency from the quantity stated on the label within a sample of randomly selected packages. On a simplified level this could be used as the basis for some of the student investigation in the unit. More detailed information is available via the above website.

Reading

You could use the article about product packaging published by Choice in their magazine of July 2010. It is titled “watch this (empty) space” (Choice, 2010 pp 17-19). The article addresses a number of issues covered in this section.

Activities and worksheets

F1: Measurement and shapes in products
F2: What do you get for your money?
F3: Homemade versus bought
F4: Assessment and extensions.
Measurement and shapes in products

Aims and overview

In this section students will investigate and learn about how measurement and shape relate to packaging and shapes in products they buy. They will look at why some products are sold by weight (mass) while some are sold by capacity (volume).

In relation to packaging, it poses questions related to the advantages and disadvantages to consumers of different types and styles of packaging. What do you get for your money – are some ways of packaging and selling goods fairer than others?

Key maths concepts

The metric measurement system and units relevant to packaged goods:

• The metric system of units focusing on mass and volume, including estimating quantities, abbreviations, conversions between units, and appropriate choices of units.
• Discussing the connection between weight and mass and volume and capacity.

Knowledge of properties of two dimensional and three dimensional shapes relevant to packaged goods:

• The words related to shapes such as straight, curved, square, rectangle, circle, triangle, sphere, cube, rectangular prism (box), cylinder.
• Where relevant, can use standard formulae to find volume and capacity of familiar objects (cubes, rectangular prisms and cylinders).

Preparation

You need to prepare the following sets of materials.

• A collection of different packaging products and containers – some need to be full (for measurement of weight/mass) and some empty (for measurement of volume/capacity).
• Examples of suitable products include: drink containers (bottles, plastic containers, packets); food containers (tins, bottles, jars, packets); shampoos and conditioners; car product containers (oil etc.). Breakfast food packets and biscuit packets are often good types of cardboard based products to use here. Collect for yourself a set that are different sizes and capacities – these will be supplemented by what students bring in from home, but a collection of different shapes is a good starting point.
• Prepare labeled handouts for students to document their activities – see samples below. Sample worksheet F1. Activity 1A: Guess the weight and Sample worksheet F1. Activity 1B: Guess the volume.
• Measuring equipment – scales for measuring weight (reasonably accurate digital kitchen scales are best), measuring jugs for measuring volume.
Measurement and shapes in products

Activity 1: Collecting and sorting them out

Preparation:
Prior to this activity occurring, ask students to bring in for the activity any empty household product containers from home. They can include:

- empty drink containers (bottles, plastic containers, packets)
- empty food containers (tins, bottles, jars, packets)
- empty shampoo and conditioner containers
- empty car product containers (oil etc.)
- empty biscuit, lolly, breakfast food containers.

Ask students to place all their empty containers in a location in class along with your collection.

Activity 1A: Sort by units

Using your products, show them to the group and ask your students to guess what units of measurement each of the products is measured in. By choosing a variety of products you should be able to cover a range of units for both weight/mass and volume/capacity. Make sure you have products that are measured in:

- grams
- kilograms
- millilitres
- cubic centimetres
- litres.

Ask a student to record the different units on a whiteboard, projector sheet or paper.

Sample worksheet F1 Activity 1A: Sort by units

<table>
<thead>
<tr>
<th>Item</th>
<th>Mass/weight</th>
<th>Capacity</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kg</td>
<td>g</td>
<td>mg</td>
</tr>
<tr>
<td>Can of baked beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle of Vitamin C tablets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of Coco Pops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car oil container</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are likely to be some questions that arise and/or that you should pose. These include:

- What is the difference between mass and weight?
- What is the difference between volume and capacity? What units apply to which? How do the units relate to each other?
Measurement and shapes in products

• Which units are most unlikely to be used? Why?
• If the class has access to a computer and the internet you could get them in small groups to research these questions and then ask them to report back to the whole group.

After you have been through the products and summarised the results look at the metric units used and make sure students know what they all mean, how they relate to each other, what abbreviations we use etc. Cover the following:

• The metric system of units and their abbreviations for mass (g and kg) and volume/capacity (mL, L, cc).
• Conversions between units (provide some classroom lessons, activities and worksheets if necessary)
• Recognising that:
  • 1 cc = 1 ml (1 cc ice cube melted gives 1mL).
  • 1mL = 1 g of water
  • 1 kg = 1L of water (so milk cartons are weighed to check for the litre)

**Activity 1B: Sorting by measure**

In this next part of the activity, use the collection of empty containers that have been collected. Divide students up into small groups of 3, 4 or 5 students each and distribute to each group a share of the empty containers. Ask each group to sort their products into two groups according to whether they are measured in mass/weight or in volume/capacity.

Get each group to report back to the whole group and summarise as a whole group. Discuss why the different products might be measured in the units they are. Pose questions that get them to think about the reasons. For example, why are breakfast cereals measured in mass rather than volume?

Discuss what Net weight means.

Use the first two activities to pose and discuss questions such as why some products are sold by weight while some are sold by capacity.

• Are there some that could be sold by both weight and volume? Why? Why do you think they are sold in the units they are? Are there advertising advantages?

**Sample worksheet F1 Activity 1B Sort by Measure**

<table>
<thead>
<tr>
<th>Item</th>
<th>Mass/weight</th>
<th>Volume/Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can of baked beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of smarties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of Coco Pops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car oil container</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measurement and shapes in products

Activity 1C: Sort by Shape

This time ask the students to look at the collection of containers from a different perspective. Ask each group to sort their products into groups according to the shape of their packaging.

Ask each group to report back to the whole group and then you will need to help create a classification system – e.g. according to straight–sided versus curved first; and then see if you can sub-classify the curved ones into other categories such as cylinders and other. Encourage and support student’s knowledge of properties of two dimensional and three dimensional shapes including the words related to shapes such as straight, curved, square, rectangle, circle, triangle, sphere, cube, rectangular prism (box), cylinder.

Sample worksheet F1 Activity 1C: Sort by Shape

<table>
<thead>
<tr>
<th>Item</th>
<th>Mass/weight</th>
<th>Volume/Capacity</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular prism</td>
<td>Circular prism</td>
<td>(try naming the shape)</td>
<td></td>
</tr>
<tr>
<td>Can of baked beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit drink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of Coco Pops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car oil container</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discuss why the different products might be shaped the way they are. Pose questions that get them to think about the reasons. For example:

- Why might some products have straight sides rather than curved?
- What are the advantages and disadvantages of both? Think of packing reasons as well as aesthetic and advertising reasons.
- Why are some curved shapes not cylinders while some are?

Use the activity to reinforce student’s understanding of 3-D shapes, in particular the fact that like people there are family names and individual/ nick names (e.g. family name prism, individual name circular prism, popular name cylinder or family names prism, individual name rectangular prism, popular name box or family name pyramid, individual name circular pyramid, popular cone)
Measurement and shapes in products

Activity 2: Estimating and measuring

Activity 2A: Guess the weight (Mass)

Collect a set of full food containers with varying masses and label them from A to J (if you have 10 products or adjust accordingly). You will need to hide the stated mass printed on the containers – use either black markers or tape.

Ask students to guess each product’s weight (mass) including the mass of the container/packaging – invite them to pick up the item to get a feel for the weight (ensure the packages are covered or the weights have been scratched out). They first enter their guesses on the worksheet (see Sample worksheet below). Afterwards ask students to use the kitchen scales to measure the product’s actual weight.

Sample worksheet F1 Activity 2A: Guess the Weight/Mass

<table>
<thead>
<tr>
<th>Item</th>
<th>Guess</th>
<th>Actual Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can of baked beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of smarties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of barbeque shapes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of Coco Pops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car oil container</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activity 2B: Guess the Capacity (Volume)

Use a set of empty liquid containers with varying capacities and label them accordingly and ask students to guess their volumes first and enter their guesses on the worksheet (see Sample worksheet F1 Activity 2B: Guess the Capacity/Volume), then they can use the measuring cup and water to actually measure the container’s volume/capacity.

Sample worksheet F1 Activity 2B: Guess the Capacity/Volume

<table>
<thead>
<tr>
<th>Item</th>
<th>Guess</th>
<th>Actual capacity volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can of high energy drink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet of fruit juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottle of soft drink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shampoo bottle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye drops</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measurement and shapes in products

Activity 2C: Which holds more?

This whole group activity looks at how different products are packaged and whether some characteristics make the contents appear to be larger or smaller. Choose small sets of packages that are the same or similar product but that hold the same or very similar volume but are in different sized packaging (e.g. taller/wider). Make up sets of about 3 each.

Good products to use that have a range of possible shapes and sizes are shampoos, different drinks, breakfast cereals, take-away containers.

Show the different sets of product containers to the class and ask them to vote on which they think is the biggest or smallest. After each set ask someone to come and measure their volumes and discuss the results. Discuss how these characteristics might be used in advertising and marketing.
What do you get for your money?

Aims and overview

This section looks at the weight of the contents of packages and products to see how they compare with the amounts stated on the product. It also includes an activity that compares the volume of the contents of packages with their actual possible volume in order to see how much packaging is empty or wasted.

Key maths concepts

The metric measurement system and units relevant to packaged goods:

- The metric system of units focusing on mass and volume, including estimating and measuring quantities, abbreviations, conversions between units, and appropriate choices of units.

Knowledge of properties of two dimensional and three dimensional shapes relevant to packaged goods:

- Where relevant, can use standard formulae to find volume and capacity of familiar objects (cubes, rectangular prisms and cylinders).

Number and quantity skills such as:

- Unit prices or price rates eg. dollars per kilogram, cents per 100gm.

Preparation

You need to prepare the following sets of materials for Activity 1: How much empty space?

- Sets of some different products (in cardboard packaging usually) that have a difference between their full capacity and their actual contents. This should include some goods that settle once packed or ones that have a lot of internal packing or empty space – e.g. breakfast cereals, some biscuits, software boxes.

- Include different shapes and types – most will be rectangular prisms but some cylindrical shapes would be good – e.g. something like Pringles chips.

- Prepare labelled handouts for students to undertake F2 Activity 1: How much empty space.

You also need to prepare the following sets of materials for Activity 2. How much do you get?

- Sets of 3 or 4 packets of the same brand and size of products that are sold by weight – enough sets for small groups of 3 or 4 students. You could ask the students to bring them along to the class. You can double up and use some of the same products in the first set above.

- Example of suitable products to use include biscuits, sweets and loaves of bread

- Prepare labeled handouts for students to undertake the activities in – F2. Activity 1: How much do you get?

- Measuring equipment – scales for measuring weight
What do you get for your money?

(reasonably accurate digital kitchen scales are best).

Activity 1: How much empty space?

This activity gets students to compare the volume of the contents of a solid package with the actual possible volume that the package could hold. This is best done as a small group activity. Set students to undertake the following steps.

- Provide to each small group of students (2 or 3) some different product packages that have a difference between their full capacity and their actual contents.
- Ask students to open the package carefully without removing the contents and estimate or calculate what fraction of the actual package the contents take up. This is set out as an investigation in F2. Activity 1: How much empty space?
- After all groups have completed their investigations get the whole group to share and discuss their findings. Ask questions like:
  - Were there many products where there was a lot of empty space or wasted packaging?
  - Is there a reason for why this might have been the case?
  - Where was there little empty space, where was the amount larger or excessive? Why?
  - Ask for other examples where they are aware this happens.

Activity 2: How much do you get?

This activity gets students to compare the actual weight of the contents of a package with its stated amount. This is also best done as a small group activity. Students undertake the following steps.

- Provide to each small group of students (2 or 3) a packet of the same brand and size of packets (biscuits are good).
- Ask them to take the actual food item out of its packaging and let them weigh the contents. This is set out as a student investigation: F2. Activity 2: How much do you get?.
- After all groups have completed their investigations get the whole group to share and discuss their findings. You could record all their results and work out class averages.

Of course, you can let them share the food around to eat after they have weighed the contents.

As a whole group discuss their findings. Were there any surprises?

Extensions/ applications

- Design and make a new package for a particular existing product that holds a different amount. For example design and make a new breakfast cereal packet that holds 500 grams rather than, for example, 375 grams; design and make a new Pringles chips container that holds 250 g rather 190 g.
- Investigate wasteful packaging of non-food goods e.g software. Ask students to think of examples and see if they can investigate and record what they find.
- What are the regulations regarding packaging and weights/volumes you get for different products?
Activity 1: How much empty space?

You might have noticed that sometimes when you buy a product there is a large amount of packaging and lots of wasted space. This is sometimes very obvious, like in some toys and games or when you buy a software package that only has a CD or DVD inside quite a large box.

In this activity you are going to compare the volume of the contents of a few packages with the actual possible volume that the package could hold, and use that information to see how much of the packaging is empty or wasted.

Work with a partner or a small group of other students. Your teacher will have asked you to bring some products from home or the teacher will have provided you with some samples to use.

For each packet you need to:

- Open up each package carefully without removing the contents so that you can estimate and calculate what fraction of the actual package the contents take up.
- You will need to do some measurements and calculations to work this out. So make sure you have a ruler available and probably your calculator.
- When you first open the packet, note where the contents come up to. You can make some marks on the packaging to help you measure the dimensions and calculate the volume.
- After you have marked the container, you can take out the contents so you can make your measurement. Keep the contents – you may need to use them in the next activity or class.
- You also need to measure the dimensions of the whole packet, container or box and calculate the total available volume of the packaging.
- Below are two formulae that you might find useful for working out the volume of different shaped packaging that you might meet.

<table>
<thead>
<tr>
<th>A rectangular prism (or box)</th>
<th>Volume = Area of base x Height</th>
</tr>
</thead>
</table>
| Volume = L x W x H | \[
\text{Volume} = \text{Area of base} \times \text{Height} \\
\text{Volume} = L \times W \times H
\]

<table>
<thead>
<tr>
<th>A cylinder</th>
<th>Volume = Area of base x Height</th>
</tr>
</thead>
</table>
| Volume = \( \pi r^2 H \) | \[
\text{Volume} = \pi r^2 H \\
\text{Usually written as} \quad \text{Volume} = \pi \times r \times r \times H
\]
Activity 1: How much empty space?

Worksheet F2 Activity 1: How much empty space?

<table>
<thead>
<tr>
<th>Item</th>
<th>Volume of actual contents</th>
<th>Available volume of packaging</th>
<th>Percentage empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (if relevant):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (if relevant):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (if relevant):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (if relevant):</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary of your results. What did you find out about the packets’ empty space?

Were there any products where there was a lot of empty space or wasted packaging? Is there a reason for why this might have been the case? Where was there little empty space, where was the amount of empty or wasted space larger or excessive? Why?

....................................................................................................................................................................................
....................................................................................................................................................................................
....................................................................................................................................................................................
....................................................................................................................................................................................

Can you think of other examples where this happens?

....................................................................................................................................................................................
....................................................................................................................................................................................

1 Note: This is the percentage empty - not the percentage full. Make sure you take the percentage full away from 100% if you have worked out the percentage of the packaging that is full.
Activity 2: How much do you get?

In this activity you are going to compare the actual weight of the contents of a package with its stated amount. Work with a partner or a small group of other students. Your teacher will have asked you to bring some products from home or will have provided you with some to use. You need about 4 packets of the same brand and size (biscuits or sweets are good).

Part A. For each packet you have you need to:

- take the actual food item out of its packaging
- use the kitchen scales to weigh the contents of each packet
- you need to record the results in the table below
- work out the averages and the differences.

After completing the task and checking with the teacher that you have finished, maybe you can share the food around to eat.

Worksheet F2 Activity 2A: How much do you get?

<table>
<thead>
<tr>
<th>Part A. Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item: ___________  Net amount stated on packet/container: ___________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Actual amount</th>
<th>Over or Under weight?</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packet 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average difference =

Average Percentage difference =

Summary of your results. What did you find out about the packets’ weight?

..........................................................................................................................................................................................
..........................................................................................................................................................................................
..........................................................................................................................................................................................

Part B. In the second part of this activity, you need to:

- find out the price of the food
- research how the product’s unit cost is calculated (visit a supermarket or visit online supermarkets - see list at end of the worksheet).
- calculate the unit cost for your product.
- compare your products unit costs with other similar products but a different brand.
- record the results in the table opposite.

After completing the task and checking with the teacher that you have finished, maybe you can share the food around to eat.
### Activity 2: How much do you get?

#### Worksheet F2 Activity 2B: How much do you get?

**Part B. Unit cost.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Brand</th>
<th>Net amount</th>
<th>Price</th>
<th>Unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compare your product’s unit costs with at least two other similar products but a different brand.

<table>
<thead>
<tr>
<th>Item</th>
<th>Brand</th>
<th>Net amount</th>
<th>Price</th>
<th>Unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Brand</th>
<th>Net amount</th>
<th>Price</th>
<th>Unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Which product had the lowest unit cost?**

.......................................................................................................................................................................................

.......................................................................................................................................................................................
Homemade versus bought

Aims and overview

In this section students will investigate and learn about whether it is cheaper to make your own product or to buy a commercial product?

Key maths concepts

The metric measurement system and units relevant to packaged goods:

- The metric system of units focusing on mass and volume, including estimating and measuring quantities, abbreviations, conversions between units, and appropriate choices of units.

Number and quantity skills such as:

- Unit prices or price rates eg. dollars per kilogram, cents per 100gm.

Preparation

You need to prepare the following sets of materials.

- Information or recipes about foods that can be easily prepared or purchased such as pizzas (from a pizza restaurant or from a supermarket), orange juice, biscuits, cakes, hamburgers.

- If you are going to get the class to make any such food items, you will need to organize the access to a kitchen and work out how you are going to provide the ingredients. Students could contribute the money to cover the costs – which would enable the introduction of some budgeting and pricing calculations.

Activity: Homemade versus bought

Is it cheaper to make you own product? This activity can be used to investigate this question. It may be that students believe that it will always be cheaper (and better?) to make you own food compared to buying it from a shop.

You and your students can answer this question by finding some products to make yourself, comparing the cost of making a product to purchasing it. Some good food items to do this with are pizzas, orange juice, biscuits, cakes, hamburgers, or frozen prepared foods.

If you have access to the use of a kitchen you could use this to actually make the foods chosen – a more inviting and challenging task for the students (and you as teacher). This would then provide an additional opportunity for students to use and apply their maths skills of measurement – cooking and following recipes is rich in using and applying maths skills.

Whether you actually make the items or not, the steps you need to organise your students to undertake are the following:

- Divide students up into small groups of 3 or 4 students each – they could group themselves according to the sort of foods they like to cook, eat or buy.

- Ask each group to choose the food they’d like to investigate and then provide each student with a copy of the worksheet so they can work together to research and answer the questions.

Discussion

Get each group to report back to the whole group.
Are they surprised by the results? Why might this be the case?
Activity 1: Homemade versus bought - The cost test

Is it cheaper to make your own food compared to buying it from a shop?

You can answer this question by finding something that you can make yourself and do a costing for making it compared to purchasing it already made. Some possible foods to do this for are pizzas (from a pizza restaurant or from a supermarket), orange juice, biscuits, cakes, hamburgers.

Work your way through the following questions. You may need to research the internet for some recipes, or ask your parents and/or visit the local shops or restaurants for costs.

<table>
<thead>
<tr>
<th>Activity and questions</th>
<th>Result/Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What food are you choosing to research and compare?</td>
<td></td>
</tr>
<tr>
<td>What commercial product are you comparing your home-cooked version with? Give the brand/shop/restaurant.</td>
<td></td>
</tr>
<tr>
<td>What size is it? Give its total weight or volume.</td>
<td></td>
</tr>
<tr>
<td>How much does it cost to buy commercially?</td>
<td></td>
</tr>
<tr>
<td>What is its cost per unit of weight (e.g. $ per kilogram)?</td>
<td></td>
</tr>
<tr>
<td>In order to make it yourself, what recipe are you using? Where did you get it from? Attach the recipe to this worksheet.</td>
<td></td>
</tr>
<tr>
<td>What is/will the final weight of your home-made version be? If you actually make something, weigh it after you have cooked it.</td>
<td></td>
</tr>
<tr>
<td>What is the cost of buying all the ingredients for your home-made version? Attach your calculations to the worksheet.</td>
<td></td>
</tr>
<tr>
<td>What is its cost per unit of weight (e.g. $ per kilogram) for your home-made version?</td>
<td></td>
</tr>
<tr>
<td>Which product is cheaper?</td>
<td></td>
</tr>
</tbody>
</table>

Summary of your results.
Is it cheaper to make your own product or to buy commercial products?

Why do you think this is the case? Are you surprised?

.......................................................................................................................................................................................
.......................................................................................................................................................................................
.......................................................................................................................................................................................
.......................................................................................................................................................................................

CONTINUED
Assessment and extension work

Assessment task 1

A possible assessment task that would pull together all the knowledge and skills would be to ask students (individually or in teams) to investigate one product type (e.g. breakfast cereals; high energy drinks; shampoos; fruit juices) and report against the following questions and issues:

- Describe the range of types and sizes of the packaging (in terms of shape and amount (mass or volume).
- Describe how the shapes of the packaging are used (e.g. for packing purposes, for eye-catching advertising purposes).
- Compare the different brands and sizes of packaging in relation to value for money (amount per price).

They could produce the report in a written report, as a PowerPoint, as a poster, or as a digital story.

Assessment task 2

Another possible assessment task that is a variation on the above would be to ask students (individually or in teams) to investigate cardboard packages in terms of the nets of their 3-D shapes. For example, students could investigate the different sized packages of the same brand and type of breakfast cereal. They could take apart the packets and investigate how they are constructed.

- You could ask them to create their own packaging for a different size to one that exists? For example create a new box that holds twice as much (has twice the volume)?
- Or they could be asked to design a new (breakfast cereal) product and design new packaging – let students work in teams and use their different skills jointly to create a new product (the name, the size of the packet, what price they will charge, how they will market it). This is an opportunity to integrate the activity/task with literacy skills too.
Responsible gambling - Introduction

Background Information

Gambling is any activity where money (or anything of value) is put at risk on an event of uncertain outcome that relies, in part or entirely, on chance. Gambling includes:

- Gaming – where the outcome is decided largely by chance. Examples include lotteries, pokies, bingo, Scratchies, casino and card games.
- Betting or wagering – on the outcome of a future event. Examples include horse racing, sports betting, Internet betting and TAB betting.
- Speculation – such as gambling on the stock market.

Appropriate definitions for teachers to use and refer to are:

Responsible gambling – Responsible gambling is about minimising harm caused by problem gambling while accommodating those who gamble without harming themselves or others.

Problem gambling – Problem gambling is defined as behaviour characterised by difficulties in limiting money and/or time spent on gambling, which leads to adverse consequences for the gambler, others or for the community.

Useful Resources

www.problemgambling.vic.gov.au
www.justice.vic.gov.au > gambling and racing > responsible gambling
www.youthgambling.com
www.betterhealth.vic.gov.au
www.austgamingcouncil.org.au

It is illegal for anyone under 18 to gamble, including on Scratchies and Lotto. In 2006 the Department of Justice published Problem gambling: a guide for Victorian schools (copies can be obtained by visiting www.problemgambling.vic.gov.au/contact-us). It cites a 2000 study that found that 41 per cent of year 8 students had gambled in some form over the past 12 months. Scratchies and lotto are the most common forms of gambling for young people. In the same study close to 50 per cent viewed gambling as a way to make money. The guide cites research that suggests that problem gambling in adolescents may be more prevalent than the adult population. Clinicians claim that these gamblers rarely identify as problem gamblers, possibly because the stereotyped gambler has little in common with an adolescent. Young problem gamblers are more likely than non-gamblers to report higher rates of depression and anxiety, participate in risky behaviour such as alcohol or drug use, be involved in crime and develop problems with family and friends. It has been shown that young adolescents are generally still forming their attitudes to gambling, leading to early intervention as a strategy to reduce problem gambling.

Issues raised in this section may lead to notice of problem gambling in students or within students’ families. Any issues should be handled with sensitivity. Gamblers’ Help Line is 1800 858 858. Kidshelp Line – www.kidshelpline.com.au or 1800 551 800.
Nature of chance

Aims and Overview
In this section students will develop and apply simple skills of probability in order to understand the concept of chance. They will appreciate that maths can contribute to an understanding of gambling risks.

Key Concepts
- chance and associated terms such as luck, likelihood and risk
- identification of events as more, less or equally likely
- description of probabilities in terms of chance and a number between 0 and 1
- Expression of chance as a long term expectation

Preparation
- A sheet of 8 rows of 25 squares that can be cut up by students

Introduction
- Discuss with students the every day language of chance, including luck and risk and phrases such as more, less or equally likely. Use examples to illustrate the discussion

Class work
- Exercises 1 and 2 could be completed independently and then in a group, reaching group consensus. Students would need to defend choices and be persuaded to change assessments, introducing the estimative nature of chance
- Exercise 3 could be completed independently
- Exercise 4 should be completed in a group. Part iv), Exercise 5 and Exercise 6 could be discussed as a class. This should include identification of independent trials. Students may need assistance in recognising the long term nature of odds and reasons for the difference between the theoretical probability and the actual outcomes.

Extension/Revision
Ask students to provide answers and explanations

Possible Assessment Strategies
Assessment of learning:- Use the introductory activities to gauge student skills and knowledge; as students debate results in groups they show evidence of refinement of thinking; ask students to reflect on what they have learnt; and vary the numbers given for exercises and comparisons made.
Nature of chance

Exercises

1. a) Rate each of the following as a having a certain, excellent, very good, good, fair, poor or no chance of occurring

<table>
<thead>
<tr>
<th>Event</th>
<th>Chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) A throw of a pair of dice showing 8</td>
<td></td>
</tr>
<tr>
<td>ii) The sun rising tomorrow</td>
<td></td>
</tr>
<tr>
<td>iii) Winning Tattslotto</td>
<td></td>
</tr>
<tr>
<td>iv) Socceroos winning the next World Cup</td>
<td></td>
</tr>
</tbody>
</table>

b) Choose three of the statements and explain why you assigned the rating that you did. If you assigned 'certain' or 'no chance' to anything, explain why.

2. a) Rank the following events from least likely to most likely, by placing them on the line below. Some events could be equally likely

<table>
<thead>
<tr>
<th>no chance</th>
<th>certain</th>
</tr>
</thead>
</table>

Drawing from a well shuffled pack of cards (no Joker): a 3, an ace of hearts, a red card, a picture card

b) Explain why you assigned the ranking that you did.

c) Compare a higher ranked event to a lower ranked event. Does this mean that this is how things would actually turn out?

3. Imagine that we assigned ‘0’ to something that we thought had no chance of happening at all (impossible) and ‘1’ to something certain:

Example: something halfway along the line would be assigned ½. We could say it had a 1 in 2 chance of occurring. ½ is equivalent to 50%. We might say it had a 50% chance of occurring. Note it also has a 50% chance of not occurring.
Nature of chance

i) What percentage would we assign to something:
   • 1/4 of the way along the line  Answer: _____________
   • 3/4 of the way  Answer: _____________
   • 1/5 along the way  Answer: _____________

ii) Express the fractions as chances e.g. 1 in 2 chance of occurring. Now express each of them in terms of not occurring.

4. Take a sheet of 8 rows of 25 squares and cut up the sheet into individual squares. You should have 200 squares. For the following activities, you will need coloured pencils and an eraser.

   In Victoria, players of scratch-it games or ‘Scratchies’ have roughly a 1 in 4 chance of winning a prize. Imagine that a coloured square in your group of squares represents a ticket with a prize and the uncoloured squares represent tickets with no prizes.

   a) i) Colour in enough squares to represent a 1 in 4 chance of winning a certain prize.

   ii) What chance is there of not winning? Answer: __________

   iii) Put the coloured and uncoloured squares into a container, for example a pencil case. Take it in turns to draw out a square. Replace the square drawn out before completing the next trial. On a separate piece of paper, draw up a table with the following headings and use it to record the empirical result from each trial:

<table>
<thead>
<tr>
<th>Trial Number</th>
<th>White Square</th>
<th>Coloured Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Complete 50 trials and take a summary total. Then complete another 50.

   Complete the following summary for the first 50 trials and then for the total 100:

<table>
<thead>
<tr>
<th></th>
<th>50 Trials</th>
<th>100 Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coloured squares drawn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage coloured squares</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage white squares drawn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   iv) Does the summary of the empirical results of your trials in iii) reflect the theoretical 1 in 4 chance? Was the 50 or 100 trials closer?

5. If each individual trial has a theoretical 1 in 4 chance of a prize, how is it possible to get a below average total in practice?

6. Does a 1 in 4 chance of winning mean that every 4 tickets bought should include 1 ticket with a prize? Explain
Nature of chance

Extension/revision activities

1. Assign probabilities to the ranking in Exercise 2 above.

2. Using the squares developed in Exercise 4 above:-
   i) Vary the colours to show different value prizes, reflecting the realistic scenario of more minor prizes than major. Draw up a key showing the value of each colour
   ii) What is the chance of winning each kind of prize you have allocated?

3. i) How would the chances of winning a prize in Exercise 4 be affected if the drawn square was not returned to the container?
   ii) Imagine that the container was a newsagency and squares were tickets sold and removed from the pool. How aware would any customer be of their chance of winning a prize?
Dice and coins

Aims and Overview

In this section students will investigate and apply basic skills of probability in order to understand the concept of independent trials, and to begin to grasp the mathematical advantage of the house in casino games.

Key Concepts

- chance, luck, including ‘lucky streak’ and risk
- independent trials
- description of probabilities in terms of chance and a number between 0 and 1
- probabilities concerning outcomes involving two dice, or two coins

Preparation

- A pair of coins and a pair of dice should be made available to each student or student groups

Introduction

- Discuss with students the every day language of chance and the notion of a ‘lucky streak’. Ask students if they have ever experienced a lucky streak and if there was any cause of this streak and whether they felt they had any control over the streak. At the end of the lesson, ask the class if their perceptions of luck and lucky streaks in games of chance have changed

Class work

- Exercise 1 could be completed independently or with a partner and exercise 2 could be completed independently and then the results used for a class discussion on luck
- For Exercise 3, students may underestimate the chance of a HT or TH as they view this as one outcome rather than two. Thus they may overestimate the chance of getting TT or HH. Understanding could be assisted by asking students to imagine that one coin was coloured red and the other green. 3d) could be discussed as a class. Make sure that students understand that each trial is independent and what an independent trial means.
- Exercise 4 could be completed independently or in groups.

Extension/Revision

- Ask students to provide answers and explanations

Possible Assessment Strategies

Assessment for learning:- Exercises 1 and 2 can be used to make students aware of current assumptions. As students test theoretical and intuitive probabilities they refine their thinking. Vary the numbers given for exercises. Ask students to reflect on their learning independently after class discussion.
Dice and coins

Exercises

1. a) Toss a coin 20 times and record the results of each trial on a separate piece of paper with the following headings

<table>
<thead>
<tr>
<th>Trial</th>
<th>Head</th>
<th>Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: 1</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

b) i) What was the total number of tails? Answer ________
ii) What was the total number of heads? Answer ________
iii) Describe the pattern of outcomes.

2. a) Now toss the coin again 35 times and attempt to predict the outcome. You will need to add an extra column to the table, headed ‘Prediction’

b) How successful were you in predicting the outcomes?

c) In these kind of trials, is there any reason why any one person could predict the result better than anyone else? Why?

A simple way to express the chance or probability of a particular event is to compare the number of ways something you want can happen to the number of possible ways something can happen:-

Probability of a particular event = \( \frac{\text{Number of successful outcomes}}{\text{Number of possible outcomes}} \)

For example, with a coin, there is one way to get a head (it lands heads) but two possible outcomes (heads or tails) so the probability of a head is \( \frac{1}{2} \) or 0.5 or 50% or a 1 in 2 chance.

3. A game called Two-up is offered at most casinos. In its most basic form, two coins are tossed and players bet on either two heads (HH) or two tails (TT). If the result is one head/one tail (HT) or one tail/one head (TH) the coins are tossed again. All bets are frozen after the first (HT or TH). Complete the following to examine why the casino would only allow bets on two heads or two tails.

a) List all the possible outcomes of tossing two coins

b) Calculate the probability of tossing either of HH, TT, HT or TH. What is the probability of tossing a head and a tail in any order?

c) Why would a casino disallow a bet of one head and one tail?

d) If someone playing two-up and betting TT, had a run of HH, is there any reason to believe that their luck would soon turn around? Why?
Consider the roll of a die. There are six numbers, so the probability of getting any one number = 1/6. If a pair of dice are rolled, there are, for example, 2 ways of getting a total of 3; rolling Die A: 1 and Die B: 2 or Die A: 2 and Die B: 1. There are 36 possible combinations from rolling two dice, so the chance or probability of rolling a total of 3 is 2/36. However there is only one way of rolling a total of 2, that is, rolling Die A: 1 and Die B: 1. The probability of a total of 2 would be 1/36.

4. a) Imagine that you were invited to play a game where you could bet on the roll of a pair of dice. You could bet on the roll showing any total under 7 or you could bet on it showing a total over 7. A total of 7 results in the house winning all the bets. Based on your first intuitive reaction, how would you rate your chances of winning? (Circle one)
   
   Excellent  Very Good  Good  Fair  Poor

b) Using two dice to assist you, draw up a table like the one below to show the number of ways that each of the totals (2 – 12) can occur on any roll – the first two are done for you:

<table>
<thead>
<tr>
<th>Dice Total</th>
<th>Combinations</th>
<th>Total ways</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>• •</td>
<td>1</td>
<td>1/36</td>
</tr>
<tr>
<td>3</td>
<td>• and • • • • and •</td>
<td>2</td>
<td>2/36</td>
</tr>
</tbody>
</table>

c) i) Add up the probabilities for rolls under 7: _____ and for rolls over 7: _____
   ii) Why would the house make a rule that a total of 7 results in the house winning all the bets?

d) The game described in a) above is called Under 7/Over 7 and is played in some casinos.
   i) What is the chance of the house winning on any one throw? Answer: _____
   ii) Express this as a percentage: _____ (iii) Is it more or less than half?: _____
   iv) Express this in terms of chance of loss for the player: _____

e) Would you change your rating of your chances now based on these calculations? Why? How would you rate your chances of losing?

Probabilities in these kind of contexts could be thought of as long term averages or long term expectations.

5. Test these theoretical probabilities by rolling a pair of dice a number of times, keeping a record of the trials and their outcomes on a separate sheet of paper. For each dice total, state whether overall it occurred more or less than its expected probability. How would you explain the difference?
### Dice and coins

#### Extension/revision activities

1. Two-up is a game offered at many casinos. Usually casinos build in a ‘house edge’ where their chances of return over the long run are greater than the players’. At most casinos the house edge for two-up occurs through the house taking all bets if a HT or TH shows five times in a row. What is the probability of this occurring? Hint: Think of the number of ways this could occur and multiply each over the number of trials.

2. Imagine that an Under 7/Over 7 game at a casino offered a $2 return for a $1 bet.
   a) If you played 36 games, how much would it cost?
   b) What is the theoretical probability of winning over 36 games?
   c) How much would you win if you won that many games?
   d) How much would you have spent?
   e) Would you be behind or ahead?
   f) What is the total amount won as a percentage of the total spent?
   g) Out of every dollar spent, how much on average would you expect to get back?

3. Consider this scenario: A casino is offering odds of 180:1 for rolling 3 dice and getting a specific triple, meaning that a $1 bet would return $181 ($180 + original $1 bet). Does this sound attractive?
   a) Calculate the chance of rolling a specific triple from 3 dice. Why does the casino offer such a high return for this outcome?
   b) Are these odds in the gambler’s favour or the casino’s? Hint: Look at the working for Question 2 above and apply similar thinking to work out if over 216 games the gambler would expect to be behind or ahead?

4. At Crown Casino, a more complex version of Under 7/Over 7 is played, called Craps. The person rolling two dice is called the Shooter. The first roll of the dice by the Shooter is called the Come Out Roll.

   A number of bets can be made. Place Bets for example, can be made on any of the point numbers (4, 5, 6, 8, 9, 10) at any time. The bet wins if the number bet on comes up before a 7 is rolled (losing if a 7 is rolled), however they do not win or lose on the Come Out Roll.

   Source: www.crowncasino.com.au
   a) It is common for players to wait until the Come Out Roll is finished before making Place Bets. Does the total of the Come Out Roll give any clue as to what the next roll might be?
   b) If a bet is placed on the Win Line before the Come Out Roll, and the Come Out Roll is a point number, the Shooter must roll that number again to win before rolling a 7. Imagine that a 5 was rolled. What is the probability that it will be rolled again before a 7? What is the probability that a 7 will be rolled first?
   c) A Hard Way is a bet on 4, 6, 8 or 10, with the bet being that the number be thrown as a double before it is thrown as a 7 or the total is thrown the easy way (i.e. any other way). Which of these numbers has the greatest chance of throwing a double?
   d) In Craps certain bets on one roll are allowed, for example a bet on the next roll being a 7 pays odd of 4 to 1, meaning that a $1 bet would return $5. Calculate the expected return, using the formula ER = probability x return.

Money and gambling

Aims and Overview

In this section students will investigate and apply basic skills of probability in order to understand the concept of independent trials, and to begin to grasp the mathematical advantage of the house in casino games.

Key Concepts

- chance, luck, including ‘lucky streak’ and risk
- independent trials
- description of probabilities in terms of a number between 0 and 1 and in terms of chance.
- Outcomes involving two dice, or two coins

Preparation

- Poster paper could be supplied for the extension activity.

Introduction

- Make sure that students can express simple probabilities as a number between 0 and 1. Discuss with students that casinos are a business that need to cover their costs and make a profit.

Class work

- Exercise 1 could be completed independently
- Exercise 2, could be completed in groups and be followed by a class discussion on entering raffles for charities and whether expectations should be to win a prize or to support a cause with what is likely to be just a donation.
- Exercise 3 could be completed independently

Extension/Revision

- Ask students to provide answers and explanations

Possible Assessment Strategies

Assessment of learning:- Use the introductory activities to gauge student skills and knowledge; as students debate results in groups they show evidence of refinement of thinking; ask students to reflect on what they have learnt; and vary the numbers given for exercises and comparisons made.
Roulette is a common casino game. It involves betting on a ball on a spinning wheel landing on a particular number or colour (red or black). A bet can be placed on 1 number (straight up) or the ball landing on one of a particular selection of numbers.

Crown Casino offers the following odds based on a layout of the numbers in a 3 x 12 table:

1. One number, straight up, including zero; 35:1
2. Two numbers, split; 17 – 1 (i.e. bet on two adjacent numbers in the same column)
3. Three numbers, street; 11:1 (i.e. bet on three numbers in a particular row)
4. Four numbers, corner; 8 – 1 (i.e. bet on 4 adjacent numbers in 2 rows and 2 columns, or on 0, 1, 2 and 3)
5. Six numbers, six-line; 5 – 1 (i.e. numbers in two adjacent rows)
6. Column, 12 numbers; 2:1
7. Even, odd, red, black, 1-18, 19-36; 1:1

Source: www.crowncasino.com.au

All casinos build in a house advantage. Crown includes a zero on the wheel and when the ball lands on zero, all bets on the columns, dozens and even chance (any section marked 'even', 'odd', 'red' 'black' '1-18' or '19-36') lose.

a) Why is this an advantage to Crown?

b) Odds of 35:1 mean that if you bet straight up on roulette, you would return $36 per $1 bet (for a $1 bet this would be $35 plus the $1 bet). There are 37 numbers (0-36) on the wheel so the probability is 1/37.

The expected return (ER) can be calculated by this formula:

ER = Probability x return

For example, for straight up bets, ER = 1/37 x 36 = 97.3%

i) Show that the ER in roulette is the same for ANY selection.

ii) Is it possible to beat the house in the long run?

c) Crown makes available a score card, so players can keep track of the numbers that come up. Consider someone who keeps score and notes that red has come up 8 times in a row, versus someone not keeping score at all. The scorer decides that black must be due and bets heavily on black. Does the scorer have an advantage?
Money and gambling

2. BoysTown is a charity that helps disadvantaged young people and families. It regularly runs lotteries in Victoria, the ACT and Queensland. For example, a typical lottery may have a maximum 310,000 tickets at $15 each, with a first prize value of $1,489,679.
   a) Calculate the probability of winning first prize with one ticket. Express this as a percentage.
   b) What percentage chance is there of not winning?
   c) If you bought every ticket in the pool, how much would you spend?
   d) In one BoysTown lottery, if you bought 10 tickets and won first prize, you would win an extra prize worth $138,000.
      i) What is the first prize value with the extra prize added? Answer: ______
      ii) How much would 10 tickets cost? Answer: ______
      iii) Calculate the probability of winning the first prize with 10 tickets instead of 1.
      iv) By how many percentage points do chances improve by spending $150 rather than $15? Would it be worth spending an extra $135 to go for an increased prize value? Why?
      v) In this particular lottery, if you bought 2 tickets and one of them won, the first prize value would increase by $41,279. Would it be worth spending double in order to go for the improved prize value? Why?

3. Poker machines – By law, each electronic gaming machine in Victoria must return to players a minimum of 87% of all monies gambled over a specified period of spins. This does not mean that every time a player spends $10, they are guaranteed an $8.70 return. It simply means that on statistical expectation each electronic gaming machine will have paid out the minimum percentage over a 12-month period. This takes millions of games.

   Each machine has a random number generator. This means that each number that appears on each reel is entirely random and independent of any other reel and any other spin.

   Each machine has an information (i) button, which when pressed, will show a button to press for Game Information. When this is pressed, the odds of winning the top five and bottom five combinations are shown.

   For a typical poker machine:

<table>
<thead>
<tr>
<th>Prize Value in Credits</th>
<th>Chance of a Prize in a Single Play Line (including scatters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One Chance in:</td>
</tr>
<tr>
<td>More than 500 credits</td>
<td>10,198</td>
</tr>
<tr>
<td>200 to 499 credits</td>
<td>2,669</td>
</tr>
<tr>
<td>100 to 199 credits</td>
<td>1,458</td>
</tr>
<tr>
<td>50 to 99 credits</td>
<td>450</td>
</tr>
<tr>
<td>20 to 49 credits</td>
<td>246</td>
</tr>
<tr>
<td>10 to 19 credits</td>
<td>106</td>
</tr>
<tr>
<td>5 to 9 credits</td>
<td>53</td>
</tr>
<tr>
<td>1 to 4 credits</td>
<td>10</td>
</tr>
</tbody>
</table>
Money and gambling

<table>
<thead>
<tr>
<th>Prize Type by Symbol Combination</th>
<th>Chance of Combination Occurring in a Single Play Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 of a kind</td>
<td>4784</td>
</tr>
<tr>
<td>4 of a kind</td>
<td>490</td>
</tr>
<tr>
<td>3 of a kind</td>
<td>45</td>
</tr>
<tr>
<td>2 of a kind</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: Can you win, Really Win on a poker machine? Pamphlet from Gambler’s Help

This means that at these odds you have to play 7 games in a row to have a 50:50 chance of winning 4 credits

a) If a credit was worth 5 cents,
   i) How much would 7 games cost? Answer: ________
   ii) How much would a win of 4 credits be worth? Answer: _______

At the above odds, you would have to play more than 7000 games in a row to have a 50:50 chance of winning 500 credits.

b) If a credit was worth 10 cents,
   i) How much would 7000 games cost? Answer: _______
   ii) How much would a win of 500 credits be worth? Answer: _______

c) Imagine that 5 of a kind on a 20c machine paid 100 credits
   i) At the chances quoted above, you would expect to win once in 4,784 games. Compare the cost of these games in total to the total won

ii) Many gamblers feel that 3 of a kind is ‘almost’ 5 of a kind. Explain why this is a fallacy, using what you know about chances of winning.
Money and gambling

Extension/revision activities

1. a) If you bet $1 000 on roulette, what is your expected $ return? Use the formula
   \[ \text{ER} = \frac{36}{37} \times \text{amount bet} \]
   b) How much do you expect to have if you bet your whole return again?
   c) How much after 10 such bets?
   d) After how many bets will you have:
      i) $500 left?
      ii) $5 left?

2. Using a mathematical example that you have constructed, make a poster for youth showing that it is unrealistic to expect to make money from casino games.

Betting on non-random events

Aims and Overview

Gambling can take many forms, including betting on events which are not entirely random, such as racing and sporting events, public events or even unusual events such as betting on the gender of a celebrity’s child. In effect, any event can be the subject of a bet. The aim of this unit is to explore further the nature of betting on non-random events and understanding how these events differ from other games of chance.

At the end of this unit, students should be able to distinguish between random and non-random events and understand how probabilities are assigned in non-random events. Students should also understand what factors make these events non-random and how this affects chances of winning and losing when betting on these events.

Key Concepts

- Non-random event
- Odds, how to calculate them and what they mean
- The relationship between odds and return and odds and probability
- The relationship between non-random events and probability

Introduction

- Make sure that students understand simple probability, including how to express the probability of an event as a number between 0 and 1, including as a fraction and percentage

Class work

- Exercise 1 could be completed independently and Exercise 2 could be completed in a group, reaching group consensus. A recorder could be assigned the role of keeping track of reasons given for choices made.
- Exercises 3 and 4 could be completed independently or with a partner.
- Exercises 5 and 6 could be completed independently and then be the basis of a class discussion on non-random events

Extension/Revision

- Ask students to provide answers and explanations

Possible Assessment Strategies

Exercise 1 could be discussed in class before students continue on. A selection of new material could be completed with the class throughout the exercises, to gauge student confidence with the problems. As students debate results in groups and in class discussion, they show evidence of refinement of thinking. Ask students to reflect on what they have learnt. Vary the numbers given for exercises.
Betting on non-random events

Exercises

Non-random events are events which have an element of chance, but which are not solely determined by chance. Lots of events rely on skill as well as chance to determine the outcome. For example, a roll of a die is pure chance. There is no extra information that can be used to predict the outcome, and the probability of any outcome is always the same.

Exercises

1. Identify which of the following events are purely random or non-random:

<table>
<thead>
<tr>
<th>Event</th>
<th>Random or Non Random?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A horse winning the Melbourne Cup</td>
<td></td>
</tr>
<tr>
<td>An AFL team winning the AFL premiership two years in a row</td>
<td></td>
</tr>
<tr>
<td>Getting a “21” in the game of blackjack</td>
<td></td>
</tr>
<tr>
<td>India winning the one day series</td>
<td></td>
</tr>
<tr>
<td>Getting a red 7 on the roulette wheel</td>
<td></td>
</tr>
<tr>
<td>Winning third division in Tattslotto</td>
<td></td>
</tr>
<tr>
<td>Your favourite film actor’s next child being a boy</td>
<td></td>
</tr>
<tr>
<td>Drawing a red ball from a sack of 40 green balls</td>
<td></td>
</tr>
</tbody>
</table>

2. a) List the teams that you think will be in the final 8 for the AFL next year.
   b) Revise this list to the final four and then the likely Grand Final contenders

   Final Four: ________________________________________________
   Grand Final: _______________________________________________

c) List factors that influenced your decisions in a) and b) above.

d) Is the probability that a given team will reach the grand final fixed over the season? Why?

Odds

Quoting odds is another means of describing the probability of a non-random event, which tries to take into account the other factors and information that might affect the likelihood of the outcome.

Whereas probability is the likelihood of one outcome out of the total possible outcomes, the odds are the number of favourable outcomes compared to the number of non-favourable outcomes.

Odds for = number of favourable outcomes : number of unfavourable

Odds against = number of unfavourable outcomes : number of favourable

Let’s say for the Melbourne Cup a bookmaker lists the following horses, and their odds for winning:
Betting on non-random events

<table>
<thead>
<tr>
<th>Horse</th>
<th>Odds</th>
<th>Horse</th>
<th>Odds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Banana Bender</td>
<td>2-1</td>
<td>7. Living in the 70s</td>
<td>71-1</td>
</tr>
<tr>
<td>2. Go Slow</td>
<td>3-2</td>
<td>8. We are the Champions</td>
<td>11-2</td>
</tr>
<tr>
<td>3. Exciting Show</td>
<td>102-1</td>
<td>9. Oppression</td>
<td>4-1</td>
</tr>
<tr>
<td>4. Max the Axe</td>
<td>7-2</td>
<td>10. Singularity</td>
<td>7-1</td>
</tr>
<tr>
<td>5. Please Release Me</td>
<td>5-4</td>
<td>11. Yes Minister</td>
<td>13-3</td>
</tr>
<tr>
<td>6. The Shuffler</td>
<td>22-1</td>
<td>12. Far Lap</td>
<td>9-1</td>
</tr>
</tbody>
</table>

Odds of 3-2 for Go Slow means that over 5 races against this field, the horse would probably win 2 of them and lose 3.

Go Slow looks like a favourite. At odds of 3:2, its odds are “short” and it is likely to win. To convert the odds to a probability:

- convert the odds against to a fraction less than 1 (where the odds are in terms of against a win. Odds in favour of a win would convert to a fraction greater than one and are referred to as odds “on”);
- use the formula \( P = \frac{\text{odds}}{1+\text{odds}} \)

So, for Go Slow, the odds fraction is 2/3 which is 0.666. The probability of it winning is therefore \( P = \frac{0.666}{1+0.666} = 0.40 \). The probability of it losing is still 0.60.

Compare Exciting Show. Its odds are “long” and the probability of winning is 0.0097 or less than 1%.

Each of the following racing exercises relate to the horses listed above.

3. a) For the horses listed above, convert the odds against into probabilities of winning (and losing) and rank the horses from most likely to win to least likely to win.

<table>
<thead>
<tr>
<th>Horse</th>
<th>Odds</th>
<th>Probability Win/Loss</th>
<th>Rank</th>
<th>Horse</th>
<th>Odds</th>
<th>Probability Win/Loss</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2-1</td>
<td></td>
<td></td>
<td>7.</td>
<td>71-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>3-2</td>
<td></td>
<td></td>
<td>8.</td>
<td>11-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>102-1</td>
<td></td>
<td></td>
<td>9.</td>
<td>4-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>7-2</td>
<td></td>
<td></td>
<td>10.</td>
<td>7-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>5-4</td>
<td></td>
<td></td>
<td>11.</td>
<td>13-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>22-1</td>
<td></td>
<td></td>
<td>12.</td>
<td>9-1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Betting on non-random events

b) Are these probabilities ‘true’ probabilities in the sense that the probability of a head landing up from the tossing of a coin is \( \frac{1}{2} \)?

c) Add up the probabilities of winning. Answer: _______

d) How much greater than 1.0 is the total? Answer: _______
   This margin represents the profit margin for the bookmaker. For example, if the total probabilities were 1.20, this represents a 20% profit margin for the bookmaker.
   What is the profit margin for the bookmaker in this race? Answer: _______
   This is much higher than typical margins of 15 -20%. Note that casinos also factor in profits when setting odds.
   The return on The Shuffler at odds of 22-1 will be quoted as $23.00, that is, $22 for every dollar bet plus my original bet. Thus if I bet $10, I would win \((10 \times 22) + 10 = 230.\) If The Shuffler loses, I lose $10.

4. a) If $16 was bet on Oppression, how much would the winnings be? _______
   b) What are the chances of losing the $16? _______
   c) What is the return offered on We are the Champions? _______

5. A gambler tells you that he has ranked the horses and is going to bet $5 on each of the top four horses to win. He tells you that this should increase his chances of making some money.
   a) How much would he lose if none of the horses won?: _______
   b) Fill in the following table and use the results to write advice for the gambler on his strategy

<table>
<thead>
<tr>
<th>Horses ranked 1 to 4</th>
<th>Odds</th>
<th>Return</th>
<th>Return on $5 bet</th>
<th>Amount gained/lost on $20 outlay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advice: _______

6. Prior to the race, you learn that Living in the 70s has a cold, Oppression has a new inexperienced jockey and Yes Minister has just passed a fitness test very well. Would you expect the odds on each of these horses to go down or up? Why?
Betting on non-random events

Extension/revision activities

1. **Trifectas**

   A Trifecta refers to a bet which picks the first, second and third horses in the correct order. Trifectas often pay out large sums due to the probability of that combination of horses occurring being so low.

   a) For the Melbourne Cup field above, calculate how many different ways the first three horses can finish.

   b) Assuming each horse were equally likely to win:

      i) calculate the probability of picking a trifecta in that Melbourne Cup

      ii) state the percentage chance that a trifecta will not be picked

   c) Now, using the table developed in Question 5 above:

      i) What is the probability of picking a trifecta of the three favourite horses, placed in the race from most favoured to least favoured?

      ii) What is the percentage chance that it won’t occur? Express the probability of this trifecta in terms of odds.

   d) Repeat the exercise for the three least favoured horses, ranked from most favoured to least favoured.

Lotto

Aims and Overview

Lotto is a popular game which can now be played on-line through international sites 24 hours a day. This unit will focus on the weekly Tatts draw held in Victoria. Students will apply basic skills of arithmetic and logic to understand that the chances of winning lotto are extremely small and that no method of picking numbers is better than any other.

Key Concepts

- Random event
- Independent Trials
- Chance

Preparation

- Provide students with a sheet of paper with a 9 x 5 grid, with numbers 1 to 45, from which they can cut 45 squares

Introduction

Use exercise 1 as an introductory activity. Make sure that students understand how Tattslotto in Victoria is played; choosing 6 numbers out of 45 and so on.

Class work

Exercise 2 should be completed in groups. Class results could be collated. Exercise 3 could be completed independently. Exercise 4 could be done with a partner, with part e) discussed as a class. It is of course unlikely that many people would buy a system 20, however the class discussion can be used to raise topics such as only using entertainment money for Lotto.

Assessment strategies

Assessment for learning – use Exercise 1 to ascertain student attitudes to, and prior knowledge of Tattslotto. Students can check answers as they complete each exercise and work out where they made their mistakes. They can use this to refine their approach to the following exercise. Vary the information given for each kind of problem.
Lotto

Exercises

1. Read the case study below and answer the questions that follow

Malvern woman won $1 million in Tattslop by using computer patterns
A woman from Malvern, who works out her Tattslop numbers from numerical patterns she develops by using Excel on her computer, won more than $1,009,700 in last Saturday's draw.
Each week she develops a different numerical pattern and plays the numbers accordingly, but this is her first big win.
“This money will be really useful for my superannuation and enable me to quietly help some people whom I know are needy,” she said today when her win was confirmed.

Source: http://www.tattersalls.com.au

a) What was the system the Malvern woman used to pick her numbers?

b) Did this system mean that she had a better chance than other people who use “lucky numbers” such as birthdays?

2. Group Activity. Form a group of four. Take a sheet of paper with a 9 x 5 numbered grid and cut out the 45 squares. Place the 45 squares into an empty container such as a pencil case. Assign one person the role of picking out the numbers. They should complete a trial run and someone in the group should record those numbers. The other three people in the group have the role of choosing the numbers. One of the three should select only numbers that mean something to them such as birthdates. Another should pick the numbers that resulted from the trial run and the final person can select any numbers they like.

i) Each member of the group should write down their six numbers.

ii) Each member should draw up a table to show the frequency with which those numbers are drawn

iii) The numbers should be picked out and then the results recorded. This is a trial. A number of trials can be completed. Players should stick with the numbers they first picked.

iv) Compare results with other members of the group.

v) Is there any reason to believe that certain numbers have a better chance of winning than others?
3. The Tattersalls web-site at http://www.tattersalls.com.au shows the frequency of numbers drawn since Draw 413. The frequency of numbers 11-20 and 31-40 is shown below as at Draw 2765.

<table>
<thead>
<tr>
<th></th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>15</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>B</td>
<td>220</td>
<td>210</td>
<td>198</td>
<td>198</td>
<td>218</td>
<td>203</td>
<td>199</td>
<td>207</td>
<td>223</td>
<td>202</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>11</td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>205</td>
<td>205</td>
<td>218</td>
<td>202</td>
<td>209</td>
<td>222</td>
<td>199</td>
<td>194</td>
<td>198</td>
<td>221</td>
</tr>
</tbody>
</table>

A = number of weeks since each number was drawn  
B = number of times each number has been drawn since Draw 413

a) How many draws do these statistics cover? Assuming one draw a week, how many years would this be?

b) A friend looks at this data and notes that 18 and 33 have not come up in that time, and that 40, 32, 36 and 14 have not come up for nearly three months. She is planning to buy a few extra games of Lotto this week, convinced that those numbers are due to come up. Using the data given in the tables above, explain to her why this system is no better than choosing numbers randomly.

4. Tattersalls gives the following probabilities for winning Tattslotto, based on a minimum of 4 games which is the minimum required to play.

Division One: 1:2, 036, 265  
Two: 1: 169, 689  
Three: 1: 9, 173  
Four: 1: 184  
Five: 1:75  
Any prize: 1: 53

a) Calculate the chance of winning from just one game, and express this as a percentage:  
Answer: ____________________

b) Calculate the percentage chance of winning if you played 50 games:  
Answer: ____________________
c) 4 games costs $2.20 and 50 games cost $27.25. Discuss with a partner whether it would be worth spending the extra money for the extra games.

d) The most expensive game is a System 20, which means that 20 numbers are chosen and put in as many 6 number combinations as possible, resulting in 38,760 games at a cost of $21,124.20. Calculate the chance of winning from playing 38,760 games in one draw.

e) Assuming 50 draws a year, how long would it take to play 200 games? How much would a system 20 cost for 200 draws? The typical Division 1 prize is roughly $800,000 per winner. Would a system 20 player be guaranteed of winning this amount after 200 games?

f) A division 4 prize is typically around $45. Assuming a minimum play of 4 games at $2.20 a game, calculate how much it would cost to play to have a statistical likelihood of winning one Division four prize.
Lotto

Extension/revision activities

1. A few years ago, the number of balls was 40. It was later increased to 45. Calculate the chance of winning from 1 game with 40 balls. Calculate the percentage decrease in chance of winning due to going from 40 to 45 balls.

2. a) You play Lotto once a week for 20 years, playing 12 games per draw at $6.55 per 12 games. After 20 years you win $8000 in second division. Calculate what it would have cost over 20 years to win $8000, assuming 52 draws a year.

   b) Assuming an interest rate of 7%, no fees, and rounding down the yearly sum calculated in a) above to the nearest dollar, calculate how much you would have earned over 20 years had you invested the yearly sum in the bank at the start of each year.

   How long would it have taken to get $8000? If you wish, you can use the Australian Securities' and Investment Commission’s (ASIC) compound interest calculator to assist you.


Shopping around

B2...p25
Look at the DOCKET and answer these questions:

1. 6am-midnight
2. 18/7/2010 and 21:35 (9:35pm)
3. $31.25
4. $31
5. $31.30
6. Percentage or out of 100 or in this case GST items
7. $1.98
8. $31.25 - $1.98 = $29.27
9. A discount of 98c has been deducted from the normal price.

B2...p26
Sample Worksheet B2. Activity 2: Labels

| 1. Salami  | 1. Bacon  |
| 3. $6.48   | 3. $5.49  |
| 4. $3.52(3.50) | 4. $4.51(4.50) |
| 5. $19.95/kg | 5. $10.45/kg |
| 7. 0.325kg | 7. 0.525kg |
| 8. $4.98   | 8. $2.61  |

| 1. Tomatoes | 1. Feta cheese |
| 2. Vegetable | 2. Dairy |
| 3. $6.13   | 3. $6.48 |
| 4. $3.87(3.85) | 4. $3.52(3.50) |
| 5. $6.29/kg | 5. $19.95/kg |
| 7. 0.975kg | 7. 0.325kg |
| 8. $1.57   | 8. $4.98  |

Look at all four of the labels together and answer the questions

9. $24.58
10. $25.42(25.40)
11. Tomatoes
12. Tomatoes
13. 2.15kg
Shopping around

B2...p28
Worksheet for Activity 3: Supermarket Labels

Some questions: prices
1. 28.48
2. 4.80
3. 15.10
4. 4.90
5. 2.72

Some questions: measurement
1. Olives, ham, cheese, frankfurts
2. Olives, ham, cheese, frankfurts
3. 415g
4. Cheese

B2...p29
Worksheet for Activity 3: Supermarket Labels

Some questions: prices
Question 1
a) Olives-$10.80
b) Potatoes-$7.70
c) Leg ham- $8.48 (8.50)
d) Edam cheese-$2.97 (2.95)

2. $29.95
3. $7.05
4. $7.56
5. $5.40
6. $2.725 (2.70)
7. Answers will depend on which supermarket they refer to

B3...p33
Worksheet for Activity 3: Unit prices

Mental estimates mostly involve halving, doubling and multiplying or dividing by 10.

Orange juice: The best buy is 3 litres for $5.87
Tomato paste: The best buy is 500 g for $2.74
Coca Cola: The best buy is 2 litres for $2.09.
Toilet rolls: The best buy is 6 rolls for $4.49.

Litre quantities are unrealistically large for comparing perfumes.
100 ml quantity comparisons are useful. They make further decimal comparisons easy.
Shopping around

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
<th>Price per 100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$89.95</td>
<td>100 ml</td>
<td>$89.95</td>
</tr>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$39.95</td>
<td>25 ml</td>
<td>$39.95 x 4 = $159.80</td>
</tr>
<tr>
<td>Cherry Blossom fragrance</td>
<td>$59.95</td>
<td>50 ml</td>
<td>$59.95 x 2 = $119.90</td>
</tr>
<tr>
<td>Sea wind fragrance</td>
<td>$41.95</td>
<td>100 ml</td>
<td>$41.95</td>
</tr>
<tr>
<td>Sea wind fragrance</td>
<td>$29.95</td>
<td>50 ml</td>
<td>$29.95 x 2 = $59.90</td>
</tr>
<tr>
<td>Frank &amp; Stein Homme fragrance</td>
<td>$79.95</td>
<td>100 ml</td>
<td>$79.95</td>
</tr>
<tr>
<td>Spring dew fragrance</td>
<td>$109.95</td>
<td>150 ml</td>
<td>$109.95 x 2÷3 = $73.30</td>
</tr>
</tbody>
</table>

**B3...p34**

Worksheet for Activity 3: Unit prices

Place your answers from Q3 on the number line. From your findings, can you quickly see which is an average priced perfume and which is the most and least expensive?

If answers are numbered A-G the answers are as follows:

D sea wind fragrance is the least expensive, B Cherry blossom is the most expensive and G, F, A, would be the average priced fragrances.

<table>
<thead>
<tr>
<th>D</th>
<th>E</th>
<th>G</th>
<th>F</th>
<th>A</th>
<th>C</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

5. Government regulations

The unit prices are expressed as follows:

- Mr. Donut  per **Individual item** i.e. per donut
- Mushroom  per **kilogram**
- Kellogs cereal  per **100 gram**
- Sunsilk Shampoo  per **100 millilitre**
- Naturale Toilet Tissue  per **100 sheets**

**B4...p35**

Sample Worksheet B4. Activity 1- Percentage Review

1. What is?
   (a) $5
   (b) $2.50
   (c) $15
Shopping around

Answers

(d) $10
(e) $5
(f) $30
2. $3.05
3. $41.80
4. GST = $25 so cost becomes $275.00

B4...p37
Worksheet for Activity 2: Sales calculations

1. Calculated answer to the nearest 5c which is what you would pay if you pay cash
   - Men’s hiking boots. $101.95
   - Women’s patent pumps. $82.45
   - Children’s sandals. $12.00
   - Natural fibre hat. $31.45
   - Retro sunglasses. $96.05
   - Women’s casual t-shirt. $9.95
   - Women’s pinstripe trousers. $53.95
   - Women’s pinstripe jacket. $69.25
   - Men’s shirts. $58.50
   - Men’s tie. $32.85
   - Men’s pinstripe suit pants. $99.00

2. Sound and audio - cost after discount
   - $70.40
   - $148.50
   - $31.60

3. Sound and audio – % of gain/loss (e.g. in first item discount ÷original cost x100 = % discount)
   - 25%
   - 7.4% (to one decimal place)
   - 18.8%
   - 27.3% (to one decimal place)

4. Sound and audio – reverse calculation (e.g. in first item 88 is 80% so 88÷80x100 = 110)
   - $110
   - $264
   - $197.50
Maths and Numeracy | Answers Section

Budgeting

C2...p45
Sample worksheet C2 Activity 5: Selling Muffins:

<table>
<thead>
<tr>
<th>Sales</th>
<th>Costs</th>
<th>Sales - Costs = Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4 \times 12 \times $2 = $96</td>
<td>Cost of materials = $6 \times 4 = $24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of labour = $14 \times 1.5 \text{hr} \times 2 \text{people} = $42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total cost = $24 + $42 = $66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$96 - $66 = $30</td>
<td></td>
</tr>
</tbody>
</table>

C2...p46
Worksheet for Activity 4: Income calculations

1. (a) $938.46,
   (b) $4066.66 (48800 ÷ 12)
   (Note: that weekly x4 = $3,753.85 - get learners to explain difference)
2. 22.5 hr x $15.5 = $348.75
3. $10,500
4. $1187.00
5. $492
6. $576
7. $1000.35

C2...p49
Sample worksheet C3 Activity 2: Paying tax:

1. $1217
2. $568
Since 1 July 2002, the minimum contribution has been set at 9% of an employee's ordinary time earnings

1. $9285.00 employer contributes = $4,720.50
2. $3273 employer contributes = $2,503.80
3. Tax = $7980 take home pay = $1,543.10 per fortnight
4. Tax = $504 employer contributes = $842.40

C2...p56-58
Worksheet for Activity 2: Budgeting for everyday living

1.

<table>
<thead>
<tr>
<th>Weekly income</th>
<th>Fortnightly income</th>
<th>Annual income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$525</td>
<td>$1050</td>
<td>$1050 \times 26 = $27,300</td>
</tr>
</tbody>
</table>
## Budgeting

### 2.

<table>
<thead>
<tr>
<th>Annual expenses</th>
<th>Yearly fee ($)</th>
<th>Due date</th>
<th>Monthly estimate ($)</th>
<th>Fortnightly calculation ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car registration</td>
<td>624</td>
<td>April</td>
<td>52</td>
<td>24</td>
</tr>
<tr>
<td>Car insurance</td>
<td>900</td>
<td>April</td>
<td>75</td>
<td>34.60</td>
</tr>
<tr>
<td>Health insurance</td>
<td>550</td>
<td>March</td>
<td>55</td>
<td>21.15</td>
</tr>
<tr>
<td>Gym membership</td>
<td>330</td>
<td>May</td>
<td>27.50</td>
<td>12.70</td>
</tr>
<tr>
<td>Further study fees</td>
<td>420</td>
<td>Feb</td>
<td>35</td>
<td>16.15</td>
</tr>
<tr>
<td><strong>Total Expenses – Task 2</strong></td>
<td><strong>2,512</strong></td>
<td></td>
<td></td>
<td><strong>96.60</strong></td>
</tr>
</tbody>
</table>

### 3.

<table>
<thead>
<tr>
<th>Service Bills</th>
<th>Frequency</th>
<th>Total</th>
<th>Monthly estimate</th>
<th>Fortnightly calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity every</td>
<td>2 months</td>
<td>$185</td>
<td>90</td>
<td>46.25</td>
</tr>
<tr>
<td>Telephone</td>
<td>monthly</td>
<td>$100</td>
<td>100</td>
<td>50.00</td>
</tr>
<tr>
<td>Gas every</td>
<td>2 months</td>
<td>$155</td>
<td>77</td>
<td>38.75</td>
</tr>
<tr>
<td>Water</td>
<td>quarterly</td>
<td>$105</td>
<td>30</td>
<td>16.15</td>
</tr>
<tr>
<td><strong>Total Expenses – Task 3</strong></td>
<td></td>
<td><strong>$545</strong></td>
<td></td>
<td><strong>$151.40</strong></td>
</tr>
</tbody>
</table>
### Budgeting

<table>
<thead>
<tr>
<th>Expense</th>
<th>Weekly</th>
<th>Monthly estimate</th>
<th>Fortnightly calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>$150</td>
<td>650</td>
<td>300</td>
</tr>
<tr>
<td>Kitty</td>
<td>$50</td>
<td>217</td>
<td>100</td>
</tr>
<tr>
<td>Car loan</td>
<td>$75</td>
<td>325</td>
<td>150</td>
</tr>
<tr>
<td>Petrol</td>
<td>$35</td>
<td>152</td>
<td>70</td>
</tr>
<tr>
<td>Fares</td>
<td>$30</td>
<td>130</td>
<td>60</td>
</tr>
<tr>
<td>Eating out/take away</td>
<td>$50</td>
<td>217</td>
<td>100</td>
</tr>
<tr>
<td>Internet ISP</td>
<td>$10</td>
<td>43</td>
<td>20</td>
</tr>
<tr>
<td>Entertainment</td>
<td>$75</td>
<td>325</td>
<td>150</td>
</tr>
<tr>
<td>Clothes</td>
<td>$20</td>
<td>87</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total Expenses – Task 4</strong></td>
<td><strong>$2146</strong></td>
<td><strong>$990</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### Task 5

<table>
<thead>
<tr>
<th>Expense</th>
<th>Fortnightly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Expenses - Task 2</td>
<td>108.60</td>
</tr>
<tr>
<td>Total Expenses - Task 3</td>
<td>140.75</td>
</tr>
<tr>
<td>Total Expenses - Task 4</td>
<td>990.00</td>
</tr>
<tr>
<td>Total Expenses – Task 5</td>
<td><strong>$1239.35</strong></td>
</tr>
</tbody>
</table>

#### Task 6

<table>
<thead>
<tr>
<th>Income / Expenses</th>
<th>Fortnightly Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income - Task 1</td>
<td>1050.00</td>
</tr>
<tr>
<td>Total Expenses - Task 5</td>
<td>1239.35</td>
</tr>
</tbody>
</table>

**Savings/Bottom line = Income – Expenses:** - $189.35

If *income – costs = a NEGATIVE $ amount* so Nick needs to set up a savings plan.
Paying bills

D2...p67
Worksheet for Activity 3: A fair split in a shared house

1. $175.00, share in the ratio of 2:2:1 means 5 parts in total so $175 ÷ 5 = 35.
Therefore money ratio is $70:$70:$35

2. The $207.50 bill should be shared and the bill was made up of:

<table>
<thead>
<tr>
<th>Charges</th>
<th>Tim ($)</th>
<th>Sophie ($)</th>
<th>Nick ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service and equipment’ = $75</td>
<td>25.00</td>
<td>25.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Sophie’s call charges = $54.25</td>
<td></td>
<td>54.25</td>
<td></td>
</tr>
<tr>
<td>Tim’s calls charges = $23.45</td>
<td>23.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nick’s calls charges = $54.80</td>
<td></td>
<td></td>
<td>54.80</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>$48.45</strong></td>
<td><strong>$79.25</strong></td>
<td><strong>$79.80</strong></td>
</tr>
</tbody>
</table>

3. Total of $78.50 on a party, the bill should be split based. Each host was paying for themselves and their friends.

<table>
<thead>
<tr>
<th></th>
<th>Tim</th>
<th>Sophie</th>
<th>Nick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Themselves</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Number of friends</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Number of shared friends</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td><strong>People totals</strong></td>
<td><strong>4.5</strong></td>
<td><strong>4.5</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

This means 13 parts in total so $78.50 ÷ 13 = $6.
Therefore money ratio is $27:$27:$24

4. The bill of $280.65 covers the period 20th April to 29th July. This means 10 + 31 + 30 + 29 = 100 days
Nick did not move into the house until 1st June so he is there for 60 days ‘The electricity cost per day is $2.80.’ (this bit of information is not used in the following method.

<table>
<thead>
<tr>
<th></th>
<th>Tim</th>
<th>Sophie</th>
<th>Nick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days</td>
<td>100</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td><strong>Simplest Ratio</strong></td>
<td><strong>5 parts</strong></td>
<td><strong>5 parts</strong></td>
<td><strong>3 parts</strong></td>
</tr>
</tbody>
</table>

This means 13 parts in total so $280.65 ÷ 13 = $21.58.
Therefore money ratio is $107.95:$107.95:$64.75
Paying bills

5. Estimate answers to the following ratios. Say whether the estimates are likely to be less (L) than or greater (G) than the exact (E) answer.

- Divide $177.95 by 9 to estimate ratio 20:160 G
- Divide $177.95 by 9 to estimate ratio 80:100 G
- Divide $110 by 10 to estimate ratio 11:33:66 E
- Divide $249.90 by 10 to estimate ratio 25:75:150 G
- Divide $240 by 6 to estimate ratio 40:80:120 E
- Divide $189 by 10 to estimate ratio 20:40:60:80 G

D3...p70
Worksheet for Activity 2: Talk Time

<table>
<thead>
<tr>
<th>Plan A</th>
<th>New price</th>
<th>Usage one month</th>
<th>Cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locals calls</td>
<td>20c per call</td>
<td>125 calls</td>
<td>$25.00</td>
</tr>
<tr>
<td>Capped STD calls</td>
<td>$2.25 per call between 7pm (4pm Sat) and midnight</td>
<td>18 calls</td>
<td>$40.50</td>
</tr>
<tr>
<td>Capped calls to same company mobiles</td>
<td>$2.25 per call between 7pm (4pm Sat) and midnight</td>
<td>4 calls</td>
<td>$9.00</td>
</tr>
<tr>
<td>Calls to same company mobiles</td>
<td>33c /min (24 hrs, 7 days a week)</td>
<td>40 min</td>
<td>$13.20</td>
</tr>
<tr>
<td>Calls to other company mobiles</td>
<td>37c /min (24 hrs, 7 days a week)</td>
<td>35 min</td>
<td>$12.95</td>
</tr>
<tr>
<td>Monthly line rental</td>
<td>$23.50</td>
<td></td>
<td>$23.50</td>
</tr>
<tr>
<td><strong>Total cost per month</strong></td>
<td></td>
<td></td>
<td><strong>$124.15</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan B</th>
<th>New price</th>
<th>Usage one month</th>
<th>Cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locals calls</td>
<td>30c per call</td>
<td>125 calls</td>
<td>$37.50</td>
</tr>
<tr>
<td>Capped STD calls</td>
<td>$3.00 per call between 7pm (4pm Sat) and midnight</td>
<td>18 calls</td>
<td>$54.00</td>
</tr>
<tr>
<td>Capped calls to same company mobiles</td>
<td>$3.00 per call between 7pm (4pm Sat) and midnight</td>
<td>4 calls</td>
<td>$12.00</td>
</tr>
<tr>
<td>Calls to same company mobiles</td>
<td>37c /min (24 hrs, 7 days a week)</td>
<td>40 min</td>
<td>$14.80</td>
</tr>
<tr>
<td>Calls to other company mobiles</td>
<td>42c /min (24 hrs, 7 days a week)</td>
<td>35 min</td>
<td>$14.70</td>
</tr>
<tr>
<td>Monthly line rental</td>
<td>$17.50</td>
<td></td>
<td>$17.50</td>
</tr>
<tr>
<td><strong>Total cost per month</strong></td>
<td></td>
<td></td>
<td><strong>$150.50</strong></td>
</tr>
</tbody>
</table>
Youth credit and debt

**E2...p92**
Worksheet for Activity 2: Using credit cards wisely

1. Use Tye Miller’s credit card statement to answer the following questions.
   a. yes, $144.35
   b. $262.03
   c. $25

2. Tye paid only the minimum amount due and spent $230, with a government charge of $0.73.
   a. To calculate interest charged in the next statement issued on 5 June?
      i. Balance before interest is: $262.03-$25.00=$237.03
      ii. Interest is: amount x no. of days x daily interest rate
         $237.03 x 32 days x 0.04397% = $3.34
   b. To calculate the closing balance for the next statement add the two answers above
      $262.03-$25.00 + $230.00 + $3.34 + $0.73 = $471.10

3. On Tye’s card, cash advances do not have an interest-free period. Despite this, he takes out a $100 cash advance on 7 June.
   a. How much interest will he eventually be charged on this $100, if his next payment, made on the due date of 29 August, is for the total amount owing?
      52 days to 29 Aug: $100 x 0.0004397 x 52 = $2.29

**E3...p94**
Worksheet for Activity 3: Buying on terms

• Answers will vary
• Answers will vary
• Cost of TV

1. Plan 1 = $699.00
2. Plan 2 = (40X12 +1/2 of 799) = $879.50
3. Plan 3 = (50 x24) = $1200.00
4. Plan 4 = (10 + 2.50x360) = $910.00
   • Plan 3
   • Plan 1
   • Extra money paid over cash deal
     Plan 2 = $879.50 – 699.00 = $180.50
     Plan 3 = $1200.00 – 699.00 = $501.00
     Plan 4 = $910.00 – 699.00 = $211.00
   • Extra cost as a percentage(to first decimal place)
     Extra amount ÷Cash cost x 100 = % extra
     Plan 2 = 25.8%
     Plan 3 = 71.7%
     Plan 4 = 30.2%
# Youth credit and debt

## E4...p96

Worksheet for Activity 1: Calculating interest

- $5
- $9.95
- $1.85
- $4.90
- $30.62
- $1000.00

<table>
<thead>
<tr>
<th></th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (19.99%/12=1.67%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Month 1</strong></td>
<td>$200.00</td>
<td>$30.00</td>
<td>$170.00</td>
<td>$2.84</td>
<td>$172.84</td>
</tr>
<tr>
<td><strong>Month 2</strong></td>
<td>$172.84</td>
<td>$30.00</td>
<td>$142.84</td>
<td>$2.38</td>
<td>$145.22</td>
</tr>
<tr>
<td><strong>Month 3</strong></td>
<td>$145.32</td>
<td>$30.00</td>
<td>$115.32</td>
<td>$1.92</td>
<td>$117.24</td>
</tr>
</tbody>
</table>

**Compound interest** $7.14

Use the compound interest formula $A = P \left(1 + \frac{r}{n}\right)^{nt}$. Otherwise set up tables as shown above.

<table>
<thead>
<tr>
<th></th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (16.5%/12=1.37%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Month 1</strong></td>
<td>$450</td>
<td>$30</td>
<td>$420</td>
<td>$5.75</td>
<td>$425.75</td>
</tr>
<tr>
<td><strong>Month 2</strong></td>
<td>$425.75</td>
<td>$30</td>
<td>$395.75</td>
<td>$5.42</td>
<td>$401.15</td>
</tr>
<tr>
<td><strong>Month 3</strong></td>
<td>$401.15</td>
<td>$30</td>
<td>$371.15</td>
<td>$5.08</td>
<td>$376.23</td>
</tr>
<tr>
<td><strong>Month 4</strong></td>
<td>$376.23</td>
<td>$30</td>
<td>$346.23</td>
<td>$4.74</td>
<td>$350.97</td>
</tr>
</tbody>
</table>

**Compound interest** $20.99
## Youth credit and debt

<table>
<thead>
<tr>
<th></th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (9.99% ÷ 12=0.83%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>450</td>
<td>$30</td>
<td>$420</td>
<td>$3.49</td>
<td>$423.49</td>
</tr>
<tr>
<td>Month 2</td>
<td>$423.49</td>
<td>$30</td>
<td>$393.49</td>
<td>$3.27</td>
<td>$396.67</td>
</tr>
<tr>
<td>Month 3</td>
<td>$396.67</td>
<td>$30</td>
<td>$366.67</td>
<td>$3.04</td>
<td>$369.71</td>
</tr>
<tr>
<td>Month 4</td>
<td>$369.71</td>
<td>$30</td>
<td>$339.71</td>
<td>$2.82</td>
<td>$342.53</td>
</tr>
<tr>
<td><strong>Compound interest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$12.62</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Opening Balance</th>
<th>Payment</th>
<th>Amount to pay interest on</th>
<th>Monthly interest (6.25% ÷ 12=0.52%)</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>450</td>
<td>$30</td>
<td>$420</td>
<td>$2.18</td>
<td>$422.18</td>
</tr>
<tr>
<td>Month 2</td>
<td>$422.18</td>
<td>$30</td>
<td>$392.18</td>
<td>$2.04</td>
<td>$394.22</td>
</tr>
<tr>
<td>Month 3</td>
<td>$394.22</td>
<td>$30</td>
<td>$364.22</td>
<td>$1.89</td>
<td>$366.11</td>
</tr>
<tr>
<td>Month 4</td>
<td>$366.11</td>
<td>$30</td>
<td>$336.11</td>
<td>$1.74</td>
<td>$337.85</td>
</tr>
<tr>
<td><strong>Compound interest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$10.03</strong></td>
</tr>
</tbody>
</table>
Responsible Gambling

G1...p120

2. a) A 3: There are four 3s in the pack, 1 ace of hearts, 26 red cards and 12 picture cards. Likelihood from lowest to highest: ace of hearts, a 3, a picture card, 26 red cards
b) the greater the number of cards of a particular kind within a well shuffled deck, the greater chance it has of being drawn.
c) not necessarily. This ranking is a theoretical chance. In practice, a lower ranked card could be drawn out while none of the more highly ranked cards are.
3. i) 25%, 75%, 20% chance
ii) Of occurring: 1 in 4 chance, 3 in 4 chance, 1 in 5 chance
Of not occurring: 3 in 4 chance, 1 in 4 chance, 4 in 5 chance
4. ii) 3 in 4 chance
5. Each trial is independent, that is, it starts fresh, without any influence from what has gone before. In addition, there may be a short period of time over which the trials take place. Expressions of chance are long term averages.
6. No, this refers to the ticket pool as whole. Within that pool, there is a random distribution of tickets.

Student investigation answers

1. Probability of an ace of hearts = 1/52; probability of a 3 = 4/52 or 1/13; probability of a picture card = 12/52 or 3/13; probability of a red card = 26/52 or
2. ii) To calculate the chance of each prize allocated, express the number of tickets with that prize compared to the total number of tickets as a fraction or percentage.
3. i) This would depend on if the square drawn was a prize or not. When the square drawn is white and not returned, this leaves fewer squares in total and greater chance of drawing the prize. On the other hand if the coloured square was drawn early and not returned, the chance of drawing the prize from then on would remain the same.
ii) the player would not be aware of how early the major prize or any of the other prizes were taken. It is unlikely for scratchies that a major win would be announced as this would mean that the rest of the tickets would not be sold and the business would lose takings.

G2...p124

2. c) No. Each toss of the coin is a random toss involving pure chance. There is no skill involved. As such, the outcome of any trial does not depend on what occurred before and so is an independent event.
3. a) HH TT HT TH
3. b) Each outcome has a probability of ¼. The probability of tossing a head and a tail in any order is ¼ + ¼ = ½ or 50% or a 1 in 2 chance
3. c) TH/HT has a higher probability than TT or HH
3. d) No, each toss is an independent trial or event. While there may be a long run expectation of ¼, this is not certain
4. c) i) probability for rolls under 7 = 15/36
   probability for rolls over 7 = 15/36
   ii) There is the highest chance of scoring this total
**Responsible Gambling**

i) No, the casino will win in the long run. Roulette should only be played for social enjoyment, not as a way to make money.

ii) No, each spin of the wheel is independent and the result of any spin has no bearing on subsequent spins.

2. a) \( \frac{1}{310\,000} \) or approximately 0.000323%
   b) 99.9997%
   c) $4,650,000
   d) i) $1,627,679
      ii) $150
      iii) \( \frac{10}{310\,000} = 0.00323\% \)
   iv) $0.002907. In discussing whether it is worth spending this extra money, the negligible increase in chance should be considered against the significant increase in spending.
   v) The extremely negligible increase in chance of winning should be considered against the significant increase in spending.

3. a) i) 35 cents.
   ii) 20 cents
   b) i) $700
      ii) $50
   c) i) At the chances quoted above, you would expect to win once in 4,784 games.
      Compare the cost of these games in total to the total that could be won
      Total cost = 4,784 \times 0.20 = $956.80
      Expected win = 100 \times 0.20 = $20
      Expected Loss = $936.80
      ii) the chance 3 of a kind is 1 in 45 whereas 5 of a kind is 1 in 4,784. These chances are not close to each other. Similarly, as the machines are random number generators, getting 3 of a kind in one roll does not mean that you are closer to getting 5 of a kind on the next roll.

**Student investigation answers**

1. a) \( ER = \frac{36}{37} \times 1000 = $973 \)
   b) \( ER = \frac{36}{37} \times 973 = $947 \). This can be generalised to \( ER = 1000 \times (\frac{36}{37}) \text{ to the power of } n \) where \( n \) = number of bets
   c) after 10 bets $760 remains
   d) after 26 bets $490 remains
   e) after 197 bets $5 remains

2. the mathematical example should show a return of less than 100%
1.

<table>
<thead>
<tr>
<th>Event</th>
<th>Random or Non Random?</th>
<th>Event</th>
<th>Random or Non Random?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A horse winning the Melbourne Cup</td>
<td>Non-random</td>
<td>Geelong winning the Premiership again in 2009</td>
<td>Non-random</td>
</tr>
<tr>
<td>Getting a “21” in the game of blackjack</td>
<td>Non-random</td>
<td>India winning the one day series</td>
<td>Non-random</td>
</tr>
<tr>
<td>Getting a red 7 on the roulette wheel</td>
<td>Random</td>
<td>Winning third division in Tatsslotto</td>
<td>Random</td>
</tr>
<tr>
<td>Britney Spears’ next child being a boy</td>
<td>Non-random</td>
<td>Drawing a red ball from a sack of 40 green balls</td>
<td>Non-random</td>
</tr>
</tbody>
</table>

2. c) Betting on a particular football team to win the grand final depends on a number of factors which could include:

- how good the players are;
- whether any star players may not play because of suspension or illness;
- whether one side has defeated the other side convincingly during the year;
- whether the side has had to travel a long way to get to the game; and
- how much finals experience the coach has had.

   d) The probability that the team might win will vary at any particular time dependent factors such as those listed in c) above. At the beginning of the season, a team may have a low probability of making and winning the grand final but later in the season, that probability may be different.

3:

<table>
<thead>
<tr>
<th>Horse</th>
<th>Odds</th>
<th>Probability Win/Loss</th>
<th>Rank</th>
<th>Horse</th>
<th>Odds</th>
<th>Probability Win/Loss</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2-1</td>
<td>0.33/0.67</td>
<td>3</td>
<td>7</td>
<td>7-1</td>
<td>0.014/0.986</td>
<td>11</td>
</tr>
<tr>
<td>2.</td>
<td>3-2</td>
<td>0.40/0.60</td>
<td>2</td>
<td>8</td>
<td>11-2</td>
<td>0.15/0.85</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>102-1</td>
<td>0.0097/0.9903</td>
<td>12</td>
<td>9</td>
<td>4-1</td>
<td>0.20/0.80</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>7-2</td>
<td>0.22/0.78</td>
<td>4</td>
<td>10</td>
<td>7-1</td>
<td>0.13/0.87</td>
<td>8</td>
</tr>
<tr>
<td>5.</td>
<td>5-4</td>
<td>0.44/0.56</td>
<td>1</td>
<td>11</td>
<td>13-3</td>
<td>0.19/0.81</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>22-1</td>
<td>0.044/0.956</td>
<td>10</td>
<td>12</td>
<td>9-1</td>
<td>0.10/0.90</td>
<td>9</td>
</tr>
</tbody>
</table>
3. b) No, horse racing is a non random event subject to several factors.
   c) 2.23
   d) Total is greater than 1 by 1.23. Profit margin is 123%.
4. a) Odds on Oppression are 4-1, meaning a return of $5.00
    Bet = $16, so win would be $5.00 x 16 = $80.
    b) Chance of losing $16 is 80%.
    c) $6.50
5. a) $20

<table>
<thead>
<tr>
<th>Horse</th>
<th>Odds</th>
<th>Return offered</th>
<th>Return on $5 bet</th>
<th>Amount gained/lost on $20 outlay</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5:4</td>
<td>$2.25</td>
<td>$11.25</td>
<td>$8.75 lost</td>
</tr>
<tr>
<td>2</td>
<td>3:2</td>
<td>$2.50</td>
<td>$12.50</td>
<td>$7.50 lost</td>
</tr>
<tr>
<td>1</td>
<td>2:1</td>
<td>$3.00</td>
<td>$15.00</td>
<td>$5.00 lost</td>
</tr>
<tr>
<td>4</td>
<td>7:2</td>
<td>$4.50</td>
<td>$22.50</td>
<td>$2.50 gain</td>
</tr>
</tbody>
</table>

Advice: The friend is much more likely to lose money than make money. The only chance of a gain would be if Horse 4 won, which actually is ranked fourth, with the worst chance of winning out of the four. This is not a good strategy.

Student investigation answers
1. a) $12 x 11 x 10 = 1320
   b) i) $1/12 x 1/11 x 1/10 = 0.00075 = 0.075%.
       ii) Probability of not picking is 99.925%.
   c) i) The favourite is Please Release me at P = 0.44, followed by Go Slow at P = 0.397 and Banana Bender at P = 0.33. The probability of a trifecta, in that order is the product = 0.44 x 0.397 x 0.33 = 0.058 = 5.8%.
       ii) Probability of not occurring = 94.2%. Odds = probability/(1- probability) = 0.058/94.2 = 0.061 which is roughly odds of 100:6 or 50 to 3.
   d) The least favoured are the Shuffler at P = 0.043, followed by Living in the 70s at P = 0.013 and lastly Exciting Show at P = 0.0097. The probability of a trifecta, in that order is the product = 0.043 x 0.013 x 0.0097 = 0.0000054 = 0.00054%. Probability of not occurring = 99.999946%. Odds = probability/(1- probability) = 0.0000054/0.9999946 = 0.0000054 which is roughly odds of 1,000,000 to 5 or 200,000 to 1.

G5...p138
1. a) a system of numerical patterns developed using her computer
   b) She had an equal chance of winning with every other entrant as the numbers are generated randomly every week.
Responsible Gambling

2. v) No, as each number is generated randomly. Even if the empirical trials showed that some numbers did occur more frequently over the long run, this would even out (see exercise 3).

3. a) 2352 draws. This would be just over 45 years. It is a long run data collection.
   b) Although there may be short term variances in how often the numbers drawn, in the long run each number is drawn roughly the same number of times. This is to be expected when numbers are drawn randomly and therefore have an equal chance of selection. The friend could use the long term data to calculate that each number is drawn on average roughly every 11 draws, but this is true for every number and only six are drawn at a time! On average the number of draws might be the same, but the pattern of distribution (whether for example the numbers are drawn regularly or in clusters) of each number over the period of time is random.

4. a) $8,145,060 or 0.000000123%$
   b) 0.00000614%
   d) $38,760/8145,060 or 0.005% or 1 in 200
   e) 4 years. $21,124.20 \times 200 = \$4,224,840$. Even though the chance is 1 in 200 there is no guarantee of winning the prize as the chance is an expectation or likelihood, not a certainty. The draws are independent trials, and each number is drawn randomly.
   f) The chance of winning Division 4 is 1 in 184, assuming 4 games each draw. It would cost $2.20 \times 184 = \$404.80$ to play 184 games, with the likelihood, not certainty, that one of those games would pay $45.

Student investigation answers

1. 1 game with 40 balls results in a 1 in 3,838,380 chance of winning, compared to a 1 in 8145060 chance with 45 balls. The percentage difference is $(8145060 - 3838380)/3838380 = 112\%$ decrease.

2. a) $340.60 a year spent on tattslotto x 20 years = $6812 dollars.
   b) Investing $340 at the start of each year, it would take 13.8 years to achieve $8000 and in 20 years, $14,914 would be made.