

Mathematics							
Upper Primary							
Level							
F	1	2	3	4	5	6	B6

Should I or shouldn't I?

Strand:
Chance and data

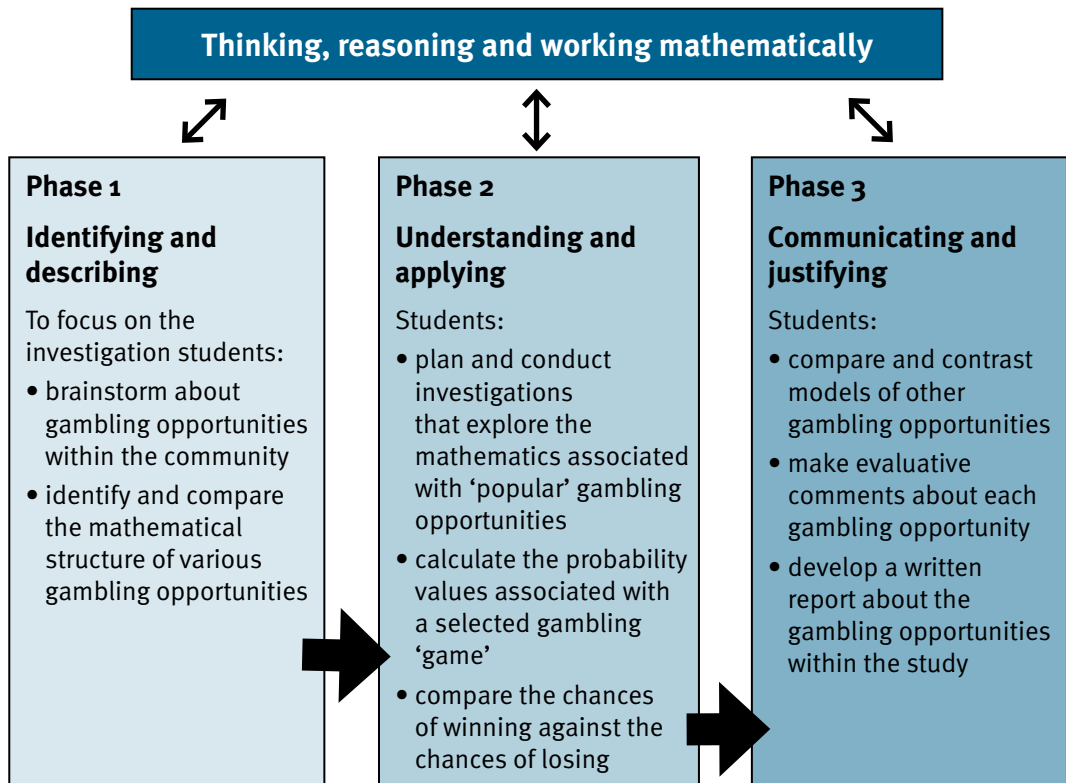
Purpose:

The main purpose of this module is to allow students to discover the real chance of winning big on any of the common gambling opportunities in the community. As they do this, students will explore the language and concepts of chance through the context of gambling opportunities that are readily visible within the community. They will model and evaluate some of these gambling opportunities and explore the numerical values of various outcomes. They will work out the probability values of these outcomes, expressing them using decimal fractions (between 0 and 1) or as percentages (between zero and 100%).

The students will create written and oral reports that describe the realistic picture about winning and losing. These reports will also identify the criteria students use when reasoning about chance events and making judgements about likelihood.

Overview of activities

The following table outlines the activities in this module about common gambling opportunities and the mathematics associated with them. It illustrates the way in which these are organised in phases and how they promote **thinking, reasoning and working mathematically**.



Core Learning Outcome

This module focuses on thinking and reasoning about a range of gambling opportunities. The related Level 4 Chance core learning outcome is:

CD 4.1 Students analyse experimental data and compare numerical results with predicted results to inform judgments about the likelihood of particular outcomes.

So that students have sufficient data about each of the selected gambling opportunities, the module will also involve the Level 4 Data core learning outcome:

CD 4.2 Students plan and carry out data collections using their own data record templates, choose and construct appropriate displays and make comparisons about the data based on the displays and measures of location.

Core Content

Chance	Data
<p>Likelihood</p> <ul style="list-style-type: none"> • language of chance <ul style="list-style-type: none"> o frequency table o relative frequency • probability values <ul style="list-style-type: none"> o impossible to certain, 0 to 1, key percentages between zero and 100% o relate colloquialisms to probability values (e.g. fifty-fifty, Buckley's chance) <p>Judgements</p> <ul style="list-style-type: none"> • subjective and numerical judgements <ul style="list-style-type: none"> o comparisons and predictions based on experimental and given data o fairness of rules 	<p>Collecting and handling data</p> <ul style="list-style-type: none"> • plan for data collection <ul style="list-style-type: none"> o data record templates o spreadsheets o existing data sources • classify and check data • discrete data <ul style="list-style-type: none"> o categorical data o count data • continuous data <p>Exploring and presenting data</p> <ul style="list-style-type: none"> • displays <ul style="list-style-type: none"> o pie charts o bar graphs o dot plots o line graphs o two-way tables o lists <p>Identifying and interpreting variation</p> <ul style="list-style-type: none"> • features of data <ul style="list-style-type: none"> o measures of location (central tendency) <ul style="list-style-type: none"> - mean - median - mode (for discrete data) • limitations of measures of location

Assessment

The assessment advice in the following table is based upon the *Elaborations* provided by the Queensland Studies Authority on its website (www.qsa.qld.edu.au).

The *Elaborations* are a resource that supports teachers to unpack each core learning outcome. They include statements about what students should know and what they should be able to do with that knowledge. The latter set of statements can be used as assessment criteria when determining the quality of students' learnings.

The assessment criteria related to demonstration of this outcome in blue type have some relevance to the context of this module. All of the other criteria appear in green type. Teachers can use the blue criteria as the basis of their assessment of students' understanding of the chance concepts included in this investigation.

CHANCE Topic

Core learning outcome	What students should know	Assessment criteria
		What students should be able to do
CD 4.1 Students analyse experimental data and compare numerical results with predicted results to inform judgments about the likelihood of particular outcomes	4a The language of chance that relates to experimental data and probability values	<ul style="list-style-type: none"> o Identify all possible outcomes of a controlled experiment o Predict the likelihood of each outcome o Record experimental data in a frequency table and reads the number of times the event occurred out of the number of trials conducted (i.e. relative frequency)
	4b What experimental data is, how to gather and analyse it	<ul style="list-style-type: none"> o Collect and organise data about a chosen probability event o Analyse collected data and decide whether enough information is available o Identify the sample space for probability events and design an experiment to collect data about it o Use frequency tables to organise data about probability events
	4c Probability values can be assigned to numerical results of experimental data	<ul style="list-style-type: none"> o Express the relative frequencies as a fraction, a decimal or percentage (the relative frequencies of an experiment will add to 1 or 100%) o Locate the relative frequency of each possible outcome on a probability scale (from impossible to certain; 0 to 1; 0% to 100%) o Relate colloquialisms such as fifty-fifty and Buckley's chance to probability values
	4d How and when to use probability values to inform judgements about the likelihood of particular outcomes	<ul style="list-style-type: none"> o Compare the predictions of the likelihood of the outcomes with experimental data o Review the number of trials in the experiment and decides whether more trials are needed o Evaluate predictions on the basis of additional data o Conduct further experiments involving variations and predict changes to the estimated probability o Explain the chances of a particular outcome using probability values o Identify and explain issues related to fairness

DATA Topic

Core learning outcome	What students should know	Assessment criteria What students should be able to do
<p>CD 4.2 Students plan and carry out data collections using their own data record templates, choose and construct appropriate displays and make comparisons about the data based on the displays and measures of location.</p>	<p>4a Data collection is planned to investigate particular situations</p>	<ul style="list-style-type: none"> o Determine the purpose for the investigation and data collection o Decide on the nature of the data to be gathered (i.e. discrete or continuous) and plans for that data collection o Conduct a trial to evaluate the data collection methods and templates used o Modify data collection methods and templates as required
	<p>4b How to design data record templates</p>	<ul style="list-style-type: none"> o Design data record templates or spreadsheets o Conduct a trial to evaluate the data collection methods and templates used o Modify data collection methods and templates as required
	<p>4c When to use different data displays</p>	<ul style="list-style-type: none"> o Analyses and describe data sets using comparative and quantitative language o Decide whether data is discrete or continuous before selecting a data display o Determine an appropriate data display for the data gathered and justifies the selection
	<p>4d The difference between discrete and continuous displays</p>	<ul style="list-style-type: none"> o Distinguish discrete data from continuous data o Explain when continuous lines can be drawn between given data points (i.e. the data is continuous) o Identify the conditions that make data discrete and reads those graphs appropriately
	<p>4e How to construct appropriate data displays for discrete and continuous data</p>	<ul style="list-style-type: none"> o Construct pie charts and bar graphs to display data o Use line graphs to display continuous data o Select when dot plots can be used to represent a set of data o Explain how dot plots can display appropriate sets of data o Select when two-way tables can be used to display relationships within a set of data o Use two-way tables when appropriate to display sets of data o Select and use lists to display data when appropriate
	<p>4f Ways to compare data displays</p>	<ul style="list-style-type: none"> o Use pie charts and bar graphs to display and compare the same set of data o Compare the use of dot plots and lists to display the same set of data
	<p>4g Purposes of measures of location</p>	<ul style="list-style-type: none"> o Identify and explains variation between sets of data o Explain the purposes for measures of location o Organise data to determine mean, median and mode o Describe the effect of outliers on the mean o Describe how the measures of location are affected by changes in the data o Make comparisons or predictions about sets of data with reference to measures of location o Use given measures of location to speculate on what the gathered responses may have been o Describe how the measures of location are affected by changes in the data

Contributions to the valued attributes of a lifelong learner

Through engagement with activities in this module, students develop the following attributes:

Knowledgeable person with deep understanding

- understands the purpose for collecting data
- makes judgements on data collected
- understands the concept of chance
- is able to make judgements about likely outcomes

Complex thinker

- analyses and organises information

Active investigator

- uses data collection to investigate questions
- accesses information from a variety of sources

Responsive creator

- uses a variety of displays to present data to a chosen audience

Effective communicator

- presents data collections to others using different data displays
- uses data displays as a means of communicating information

Participant in an interdependent world

- works independently and in groups, and acknowledges the ideas of others

Reflective and self directed learner

- looks for and recognises ways of “working mathematically” in everyday life

Background information

Gambling in Australia

Gambling is an integral part of Australian culture. It is an activity that has saturated the everyday and has impacted on the realities of children and young people.

*Today's juveniles are the first generation to be raised in an environment where legalised gambling is so pervasive, readily accessible and socially acceptable.*¹

For many people, gambling is a recreational interest that provides important opportunities for social interaction and is a harmless and enjoyable pastime. However, others may gamble excessively, resulting in high economic, social, family and personal costs. According to the *Queensland Household Gambling Survey (2001)* 0.83% of the Queensland adult population or about 22,000 people experience problems with their gambling².

It is difficult to define 'problem gambling' because behaviours and situations that harm some individuals may not cause problems for others. However, a problem gambler can be defined as 'a person whose gambling has caused unmanageability or problems in some areas of ...life, e.g. financial, marital, work, emotions, health, loss of identity, depression etc.'³ For the purpose of this module, responsible gambling could be defined as participating in gambling practices that do not result in negative health outcomes.

To read more about gambling's impact on young people refer to the Introduction section of your *Responsible Gambling Teaching Resource Kit*.

Students and disclosure

If students make personal disclosures about gambling related issues, professional support for the family or child is available through the Gambling Helpline (1800 222 050), local Gambling Help services and other community agencies such as Gam-Anon. Students may also access the Kids Help-line (1800 551 800).

Contact numbers for Gambling Help services are provided on a poster in the folder of your *Responsible Gambling Teaching Resource Kit*.

Details of help services can also be accessed via the Responsible Gambling website (<http://www.responsiblegambling.qld.gov.au>)

School authority policies

Be aware of and observe school authority policies that may be relevant to this module.

Education Queensland policies can be found at (www.education.qld.gov.au/corporate/doem/sindex/m-ind.htm).

For policies and guidelines for the Catholic sector, refer to the Queensland Catholic Education Commission website (www.qcec.qld.catholic.edu.au/policies.htm).

Responsible Gambling Education Principles and Guidelines should be referred to. These can be found in section 2 of your Teaching Resource Kit or accessed via the Responsible Gambling website (www.responsiblegambling.qld.gov.au).

¹ Jacobs (2000) *Juvenile Gambling in North America: Analysis of long term trends and future*, *Journal of Gambling Studies* 16 (2/3) pp 119-152.

² Queensland Treasury (2001) *Queensland Household Gambling Survey*, *Queensland Government*, p.2.

³ Symond, P. (1997) *A synopsis of problem/compulsive gambling*, in K. Healey (ed.), *Gambling: Issues for the Nineties*, The Spinney Press, Sydney.

Phase 1 Identifying and describing

What is gambling and which people gamble?

Students

- ▶ Have the students brainstorm about gambling and their perceptions of what constitutes gambling.
- ▶ They should discuss their own observations about gambling in response to questions such as:
 - o *Where can people go in the community to gamble?*
 - o *Should all of the 'games' people play (such as Lotto, Keno, Instant Scratch-It Caskets) be classed as gambling?*
 - o *Aren't most of these games just harmless fun?*

Teaching considerations

- In your class discussion, refer to Resource Sheet 1 and OHTs 1 and 2. The orienting activities in Idea Sheet 1, *The games we play*, will provide you with some discussion points around these resources.
- As students share their perceptions about gambling, teachers should be sensitive about privacy issues and stop students if they seem to be sharing information that is too personal about their family beliefs and practices.
- The students should be encouraged to access the Responsible Gambling website (<http://www.responsiblegambling.qld.gov.au>) and read the information provided in *School Stuff*.
- Investigate some of the history of gambling using Resource Sheets 3 and 4 and OHT 4. The orienting activities in Idea Sheet 2, *As time goes by*, will provide you with some discussion points around these resources.
- Students should also refer to the materials in the *Responsible Gambling Teaching Resource Kit* for information about gambling in the community. Students might watch and discuss the video programs or listen to the CD material. Section 12 of the Resource Kit provides a brief synopsis of the audiovisual contents to aid your selection.
- Students might watch one of the programs within the video – perhaps *Mondo Thing* – which looks at the attraction of poker machines.
- Have the students also examine available advertising about lotto, keno, instant scratch-it games, poker machines etc. They should identify the kinds of people who are the targets of the advertising (such as families, older people) as well as the theme of the particular advertisements (such as buying your kids a house or holiday, retiring comfortably etc).
- Refer to the Level 4 Arts module (*In Control – Taking Responsible Risks*) available in your Resource Kit for ideas on deconstructing these media texts, in particular Student Resource 2 (P.27).
- Students could also access the Golden Casket website to read the advertising and information available (<http://www.goldencasket.com>).

- **Teachers must be diligent in their monitoring of students' activities on the Golden Casket website and take care that they do not attempt to register on-line for any forms of gambling. Students should be made aware that it is against the law for people under 18 years of age (i.e. minors) to play the games or be sold tickets. Minors also cannot collect any winning prizes.**

Discuss the language and concept of chance

Students

- ▶ In small groups, ask students to discuss the concepts of *luck* and *risk*. Each group should then present their ideas to the whole class.
- ▶ As a class, discuss probability values and the associated language – including impossible and certain, probabilities expressed in decimal fractions from 0 to 1 or in key percentages between 0% and 100%.
- ▶ Discuss with students common colloquialisms (such as fifty-fifty, Buckley's chance) and attach meaning by relating these to probability values.

Teaching considerations

- It is important that students begin to understand that any form of gambling involves taking risks. Developing an understanding of the mathematics of any gambling opportunity can assist students in understanding the risks involved.
- Using Resource Sheet 29 – the Golden Casket *Have Fun and Play Responsibly* brochure, draw students' attention to the section entitled The Odds. They should observe that all of the regular Newsagent games are there. The students should read the probabilities of winning the major prize in each of the games.
- Have the students study the brochure and convert the information where appropriate into percentages. For example, a one in five chance of winning can be described as a 20% chance of winning. There is also an 80% chance of losing – not winning any prize at all.
- Discuss the meaning of expressions such as Buckley's chance and whether they apply to any of the games in the Golden Casket brochure.
- Discuss the students' understandings about the meaning of 'luck' and how it should be linked to chance events such as the instant scratch-it games. Link these discussions with the concept of risk. In any of the games, students need to identify their chances of winning, their chances of losing, the value of any available prizes, and whether the gamble is worth the risk.

Phase 2 Understanding and applying

How are instant scratch-it games constructed and what are the chances of winning?

Students

- ▶ Assess what students know about gambling now. Students will complete the True/False quiz (Resource Sheet 33). Ask them to keep their answers safe as they will look at them again at the end of the module.
- ▶ Students should read and analyse Resource Sheet 30 about the construction of a \$5 instant scratch-it game.
- ▶ Have students identify the total number of tickets and, from this number, identify the number of winning tickets and the number of losing tickets.
- ▶ Students should investigate the distribution of prizes across the range.

Teaching considerations

- Distribute copies of Resource Sheet 33 showing the True/False quiz. Students should answer the questions and include some of their reasons with each response. They can discuss answers with other students before deciding. Then set aside the answers until the final phase of the module.
- Have the students initially draw up tables in their groups to list the 'facts' associated with various scratch casket games – Resource Sheet 29 will provide some overall data.

- Students should identify that the brochure reveals that \$1 instant scratch-it games in Queensland involve the sale of three million tickets. This is why the chances of winning the first prize are 1 in 3 million. Ensure that students have identified the chances of winning the first prize in each of the games described in the Golden Casket brochure.
- Discuss what buyers of tickets might be thinking about as they consider the purchase of a ticket or tickets in any of the games. They should imagine the scenario that someone buys the major prize ticket during the first month that a game went on sale. Would they continue to buy tickets in that game if they knew that the first prize was already gone? What were their chances of buying that winning ticket in the first place?
- Have students analyse the table in Resource Sheet 30 which provides detailed data about the \$5 instant scratch-it game. Students can read that there are just over 193,000 winning tickets from the total of 750,000 tickets overall. They can calculate from this that there are more than 550,000 losing tickets.
- Have the students identify the odds of buying any kind of winning ticket and make a list of their observations and calculations:
 - The table suggests that there are ‘winning odds’ of 1 in 3.88 but the students may prefer to ‘round’ this information to approximately 1 in 4;
 - This means that overall, there is one winning ticket for every four tickets within the game – a 25% chance of winning some prize, a 75% chance of winning no prize;
 - Of the 193,351 winning tickets in the game, students can calculate that more than 190,000 of them involve prizes of \$50 or less;
 - Only 732 of the 750,000 tickets overall offer a prize of \$100 or more (there is one top prize of \$250,000);
 - If students consider the prizes in this group of 732 tickets as being worthwhile, their chances of winning a prize of \$100 or more are about 1 in 1,000.
- Students must see that there may be many prizes, but most of them are minor prizes – the one major prize is like a *needle in a haystack*. That prize may even be sold before most of the other tickets in the game are sold.
- The students should also discuss that if every ticket in the \$5 instant scratch-it game is sold, a total of \$3,750,000 is collected and \$2,250,000 is paid out. That leaves \$1,500,000 to cover the costs of manufacturing the tickets, advertising them, distribution costs, and profit or government taxes. This means that about 60% of the collected money is paid out as prizes.
- Using a visual model such as the divided bar graph below may assist students see this allocation of money collected:

Total money collected	
Money retained to cover costs (advertising, manufacturing, government taxes etc.)	Money paid out as prizes

Based on this proportion, when someone pays \$5 for a ticket, \$2 of that money is set aside to cover the costs outlined above, and the other \$3 is part of the pool of prize money to be paid out.

How would you make a model of an instant scratch-it game?

Students

- ▶ Have the students work in small groups to discuss ways to model an instant scratch-it game.
- ▶ The model should reduce the total numbers of tickets to a reasonable amount while maintaining the same proportion of winning and losing tickets.
- ▶ Students should decide how their models will reflect the distribution of groups of tickets to newsagents as well as the security of which tickets are the winners.

Teaching considerations

- Teachers need to know the proportions of winning/losing tickets in actual games. They should explain this mathematics to the students and show how the ‘simulated class model’ uses these same proportions. The students should be able to understand phrases such as *the chances of picking out a winning ticket are 1 in 4 – that also means that the chances of losing are 3 in 4.*
- So that no actual money is involved, teachers should ‘invent’ some class currency with the help of their students. The money can be both earned and spent only within the classroom. Students can earn money by reaching specified academic or behavioural standards (or others decided within the class). The money can be spent to purchase certain rights (such as additional computer time or extra time to complete tasks) – but only with the teacher’s approval. The money can also be risked by students to purchase tickets from the class’s instant scratch-it game. This is to ensure that students experience the sense of loss when losing tickets are purchased and understand that decisions to gamble involve risking money they could use for other purposes.
- Using the data and proportions from the real games, the students should design a model that involves smaller numbers – such as one involving 5,000 tickets.

Class model: 5,000 tickets in a \$2 instant scratch-it game

Prize	Number of winning tickets	Total Prize Payout
\$1,000	1	\$1,000
\$200	1	\$200
\$50	5	\$250
\$25	18	\$450
\$10	25	\$250
\$6	50	\$300
\$5	150	\$750
\$3	1,000	\$3,000
Total winning tickets (about 1 out of every 4 tickets)	1,250	Total prizes paid out: \$6,200
Total losing tickets (about 3 out of every 4 tickets)	3,750	

- The students should ‘mark’ these 1,250 winning tickets to distinguish them from the other losing tickets. Different colours might be used for the various prizes.

- The 1000 prizes of \$3 could have yellow dots;
- The 150 prizes of \$5 could have blue dots;
- The 50 prizes of \$6 could have pink dots;
- The 25 prizes of \$10 could have black dots;
- The 18 prizes of \$25 could have brown dots
- The 5 prizes of \$50 could have orange dots;
- The ticket with the \$200 prize could have a red dot; and
- The major prize ticket with the \$1,000 could have a purple dot.
- The students can assist with this colouring under the teacher's guidance. The students can use copies of Resource sheet 31 (each with 1,000 squares) or use MAB ones blocks if sufficient are available to represent the tickets in the game.
- To reflect the conduct of actual Instant Scratch-It games, the tickets can be divided up into smaller bundles to represent the newsagents. The teacher should be the one arranging the distribution of the winning and losing tickets into the 'newsagents' containers' to maintain the security. If there are 25 'newsagents' then each one should receive approximately 200 tickets. The teacher should ensure that each has some winning and losing tickets.

Will I take the risk and 'buy' a ticket?

Students

- ▶ Have the students discuss whether they should spend some of their class money and buy tickets.
- ▶ Have them make lists of the advantages and disadvantages of buying tickets now that they have modelled their own class game.
- ▶ Offer tickets as rewards for completing certain tasks or meeting various expectations – but students can choose to 'bank' their money to negotiate other rewards.

Teaching considerations

- Discuss the chance language associated with this model of the scratch game – *the chances of selecting a winning ticket are 1 out of 4*. The students need to understand that this applies across the entire set of tickets, not every batch of ten tickets.
- Allow every student to select four tickets at random and examine the results. Ensure that they understand that the stated odds of 1 in 4 do not mean that there will be a winner in every batch of four. If there are only 40 tickets remaining in a particular 'newsagent's' container, the number of winning tickets (or losing tickets) could range from zero up to 40.
- **NOTE: If a student wins on their first attempt it is important to stress how many didn't win at the same time. The memory of past 'wins' can be extremely powerful for young people and it is important to balance the excitement of the win with an examination of the bigger picture.**
- No one has any idea how many winning tickets the various newsagents have in their containers – or what size the prizes are. That is part of the risk that all buyers take.
- Have students set up frequency tables (refer to Resource Sheet 34) to record the results as they occur over the next few weeks. Discuss with students why more space has been made in the tally section of some results than others.
- Teachers should engineer situations so that students make multiple selections of tickets as rewards for various actions. This will ensure that 'sales' of the tickets progress reasonably quickly and the data about winners and losers will be available. The students should keep individual records of the value of tickets they have won or purchased and also how much prize money they have collected.

- Discuss how many winners there were compared with the numbers of losers in the class by inspecting each student's frequency table. The results can be expressed as percentages also.
- Have the students discuss whether they felt confident about winning whenever they spent class money buying tickets. Discuss the feelings that students had before and after scratching the tickets – some may have felt excitement before and disappointment or annoyance afterwards, especially if they scratched losing tickets.
- Have the students say whether they would spend their pocket money (or real money from any source) of instant scratch-it games. They should support their decisions with reasons.

Are other forms of gambling similar to instant scratch-it games?

Students

- ▶ Have students examine some other forms of gambling such as Lotto.
- ▶ They should identify the structure of one of these other games and make a simulated model.
- ▶ Have the students evaluate the allocation of money to risky activities such as instant scratch-it tickets (or other gambling opportunities).

Teaching considerations

- Discuss the different uses of money in everyday households – such as food, clothing and paying the home loan or other debts. Ask the students to rate these according to importance – and where they might place the spending of money of instant scratch-it tickets. Ensure that students support their placements with sound reasoning.
- Discuss other forms of gambling such as Lotto with the students. They should identify the features that attract millions of Australians to risk their money each week – such as the lure of winning large amounts of money.
- Students could simulate a simplified Lotto game within the class by having only the numbers 1 to 10 and 'players' nominating just three numbers for each game. They could conduct a number of draws to investigate their success rates.
- Teachers could illustrate to students how the probabilities for the simulated game are calculated. The chances of identifying the three numbers are 1 in 720 ($10 \times 9 \times 8$) but there are six ways of those numbers being drawn ($3 \times 2 \times 1$). So the chances of selecting all three winning numbers are 6 in 720 (or 1 in 120) or less than 1%.
- Read the newspaper article on OHT 22a and 22b. Identify the number of entries expected to be sold, the odds of winning a first division prize and the odds of winning any prize. Discuss the different costs associated with buying a lotto entry and discuss how this influences people's odds of winning. Discuss the chances of winning a big prize given what they now know about the proportions of winners and losers in instant scratch-it games.
- The students can investigate other forms of gambling by visiting sites such as the one prepared under the sponsorship of the NSW Government as part of its responsible gambling activities. Students can play the games and find out about the statistics of winners and losers in different games (<http://www.phm.gov.au/gambling.common/index.html>).
- Revisit Resource Sheet 33 - completed by students at the beginning of the module. Allow students to review their original responses – but they should explain why their reasoning has changed. Mark the quiz as a class and ensure that students understand the reasoning behind each correct answer.

Answers to the True/False Quiz.

- a. **True** – each of these games is run by the Golden Casket in Queensland with the approval of the Queensland Government. Minors under the age of 18 years are not permitted to play or collect prizes.
- b. **True** – if the odds of winning any prize are 1 in 4 for the \$2 Instant Scratch-It game, then the chances of not winning must be 3 in 4.
- c. **False** – just because the overall odds of winning a prize are calculated as 1 in 18, this does not mean that 1 out of every 18 standard entries played is a winner.
- d. **False** – the odds of winning some prize in both the \$10 Instant Scratch-It and \$3 Instant Scratch-It games are the same (1 in 4).
- e. **True** – the odds of winning some prize are listed as 1 in 5. So over the whole game, there will be 600,000 winning tickets and 2,400,000 losing tickets (to make up the 3 million tickets altogether).
- f. **True** – if the odds for winning the First Division with a 12-game entry are approximately 1 in 4,500,000, then the odds for half the number of games must be twice as bad (i.e. about 1 in 9 million).
- g. **True** – if the odds of winning some prize in the \$1 instant scratch-it game are 1 in 5, then we might expect 200 in the 1,000 tickets to be winners, leaving 800 to be losing tickets.
- h. **True** – five of the seven games listed in the brochure have between 1 million and 3 million tickets and each has one top prize. Therefore the odds for buying the single top prize tickets in these games range between 1 in 1 million and 1 in 3 million.

