



# *What are the odds?*

## *Understanding the risks*

by Sue Thomson

**FOR STAGE 4 & 5 STUDENTS**

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*What are the odds? Understanding the risks* education kit has been developed in conjunction with the exhibition *Gambling in Australia: thrills, spills and social ills* at the Powerhouse Museum, 7 April – 10 October 2004; and touring New South Wales in 2004–05 to: Newcastle Regional Museum; Albury Regional Museum; GeoCentre Broken Hill; Coffs Harbour City Gallery; Wollongong City Gallery.  
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Media partner



This exhibition is supported by the Casino Community Benefit Fund which funds G-line (NSW) — a telephone helpline for people with gambling problems — call 1800 633 635

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### Using 'What are the odds? Understanding the risks' education kit in your teaching

Annual Australian gambling losses exceed household savings and 2.1% of Australian adults are problem gamblers.<sup>1</sup> Today, Australian teenagers are growing up in a society where gambling is readily available and seen as a legitimate form of entertainment for adults.

A study conducted in 1997 (S Moore and K Ohtsuka, 1997), found that gambling among young people was a frequent, normative and approved activity. Though the rate of problem gambling in this group was found to be relatively low (3%), a greater number had gambled more than they meant to (14%) and chased losses (29%).<sup>2</sup>

Through personal experience and/or media exposure, most students have some knowledge and beliefs about gambling. However, a significant part of this knowledge will not be founded on reliable, factual information.

Use of this kit will enable your students to critically analyse the impact gambling may have on their friends, family and the community and further to empower them in making an informed choice over whether to participate in gambling as a leisure activity. It achieves this aim by:

- Informing students about the pitfalls of gambling
- demonstrating the small theoretical chance of winning
- situating gambling in a social and cultural context
- creating awareness of the social ills that can result from uncontrolled gambling.

The 'Gambling and social issues' quiz (*page 32*) can be used as an introductory activity to explore students' current knowledge and beliefs. Following a brief discussion, students could be given the quiz followed by a discussion of the correct answers and their implications. The quiz will interest students in what is to follow.

The group activity 'The costs of problem gambling' (*page 36*) can be used as a follow-up language activity to complement the quiz. The section, 'Budgets and gambling' (*page 34*) could be used as a review of the Data Strand (DS3.1: Displays and interprets data in graphs with scales of many-to-one correspondence) in the NSW Mathematics Syllabus 7–10 (2003). In this activity students will gain better insight into the financial implications of gambling on Australians at both individual and community levels through interpreting data in graphs.

1. *Australia's gambling industries*, Productivity Commission, December 1999.

2. *Gambling education: some strategies for South Australian schools*, South Australia Department of Human Services, November 2002.

The following components of the kit introduce students to the theory of probability and its application to winning, or more commonly losing, in gambling situations. The first page of each activity features information that is of interest to students and will help them to see the links and make connections to the mathematics. The activities relate to:

- Calculating probabilities
- Poker machines
- Scratch lottery tickets
- Lotto probabilities
- Horseracing.

Answers are provided on pages 38–42.

### **A word of caution**

Teachers should seek advice from their school's student counsellor over how to best respond to students who have first-hand knowledge of the possible consequences of gambling within their family or close relationships.

Remember G-line (NSW) — a telephone helpline for people with gambling problems (1800 633 635).

### **Please note**

The websites referred to in this kit were available and suitable at the time of publication. We advise teachers to check sites before recommending them to students.

### Syllabus links

The strongest syllabus link is to the Mathematics syllabus outlined here. The kit is also recommended for use in History, Commerce and PDHPE (see page 7).

### Syllabus links to the NSW Mathematics Syllabus 7–10 (2003)

By including this kit in teaching and learning programs, teachers will be assisted in providing opportunities that

- enable all students to develop positive self-concepts, and their capacity to establish and maintain safe, healthy and rewarding lives
- prepare all students for effective and responsible participation in their society, taking account of moral, ethical and spiritual considerations.<sup>3</sup>

Engaging in kit activities will help students to achieve the following learning outcomes:

- understand, develop and communicate ideas and information
- access, analyse, evaluate and use information from a variety of sources
- possess the knowledge and skills necessary to maintain a safe and healthy lifestyle
- understand and appreciate social, cultural, geographical and historical contexts and participate as active and informed citizens
- understand and apply a variety of analytical and creative techniques to solve problems.

In particular, this kit addresses the knowledge and skills, and working mathematically outcomes described in the probability component of the syllabus;

- NS4.4 — solves probability problems involving simple events
- NS5.1.3 — determine relative frequencies and theoretical probabilities
- NS5.3.2 — solve probability problems involving compound events.

3. NSW Mathematics Syllabus 7–10 (2003).

<b>Contents</b>	<b>Maths</b>  Objective — appreciate mathematics as an essential part of life  Outcomes — NS4.4, NS 5.1.3 and NS 5.3.2	<b>History</b>  Topic 8, Stage 5 — Australia’s social and cultural history in the postwar period	<b>Commerce</b>  Core content — personal finance	<b>PDHPE</b>  Content strand 3 — individual and community health
Mathematics and games of chance: a snapshot	•			•
Calculating probabilities	•			
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Budgets and gambling	•		•	•
The costs of problem gambling	•		•	•



An eight-sided bone die made by prisoners at the Narrabri Gaol, northern NSW, probably about the 1880s.

### Mathematics and games of chance: a snapshot

Gambling is an activity practised by most human societies. The basic tools of gambling — cards, dice and lots — originated in ritual as well as gaming. They were attempts to divine through chance the will of inscrutable gods.

Dice, as we know them today, are the oldest known gambling items and their use was widespread. As early as 900 BCE dice in the shape of cubes, with opposite numbers adding to seven, were popular. Some of our earliest written records include references to dice, dice games and the problem of ‘unfair dice’.<sup>4</sup>

People from all over the world including Egyptians, Greeks, Romans, Aztecs, Mayans, American Indians, Inuit and Africans used dice in gambling.

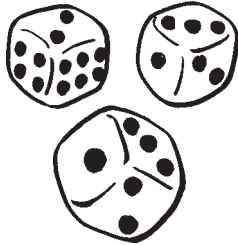
Gambling addiction is not just a modern problem. In the first century AD gamblers who had no money or articles left, offered themselves as slaves when they gambled on the roll of a pair of dice.

Playing cards were probably invented in China or India in about 900 AD. Islamic societies adopted cards and introduced them to Europe. Early playing cards were very elaborate, featuring pictures and designs. While a 52-card pack with four suits was commonly used, German and Swiss people used a 48-card pack that had no aces. In 1628 the British King Charles I banned imported cards and gave the job of printing British cards to ‘The Worshipful Company of Markers of Playing Cards’. In return for this exclusive arrangement the company was charged a duty (form of tax) and like many governments today, the British Government made a profit from gambling.

A systematic study of mathematical chance probably did not begin until the 17th century when in 1654 the two French mathematicians, Blaise Pascal and Pierre Fermat, began writing to each other about the fairest way to divide the stake in an unfinished game of chance. Their conversation combined with the work of other mathematicians established the framework from which the theory of probability is built. Many mathematicians played with these ideas over the years. Of note were members of the Bernoulli family who in the 18th century investigated chance and risk.

Mathematical probability provides an explanation for why some events happen frequently and others almost never happen. Probability theory now underpins many fields of human activity — physics, genetics, insurance, military strategy and business, just to name a few.

4. Bone rolling history  
<http://members.aol.com/dicetalk/history1.htm>



Financiers and economists use this theory as part of 'risk management' when deciding how best to how to invest money.

Using these techniques would tell them that gambling is not an investment strategy. Why is this? Try your hand at the questions in the next section.

### Language

The word 'dice' is plural.

- 1 die
- 2 dice
- A 'die' is one of a pair of dice

### Resource

- *Gambling in Australia: thrills, spills and social ills*, Charles Pickett, Powerhouse Publishing, 2004
- For a brief history of playing cards, visit <http://www.pagat.com/ipcs/history.html>
- Explore the history of dice by visiting <http://members.aol.com/dicetalk/history1.htm>

### Did you know?

In the mid 1600s, a French gambler, Chevalier de Mere, made lots of money by betting that in four rolls of a standard die, he could roll six at least once. However, when he modified the game by betting that he could roll at least one 'double six' in 24 rolls of a pair of dice, he began losing. Puzzled by his huge losses, he contacted Blaise Pascal for an answer. Pascal together with Pierre de Fermat used probability and solved the problem — the probability of getting at least one 'six' in four rolls of a single die is a bit higher than one in two, while that of at least one 'double six' in 24 throws of two dice is a bit less than one in two.

FRENCH



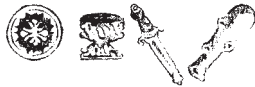
GERMAN



SWISS



SPANISH



ITALIAN



The symbols commonly used on cards today originated in France. Different symbols were used in other countries.

## Calculating probabilities

The dice have no memory.

— source unknown

The probability of rolling a 5 on a normal 6-sided die is theoretically  $\frac{1}{6}$ . When you roll the die you could get any one of the numbers 1, 2, 3, 4, 5 or 6.

There are 6 possible numbers that are all equally likely to show. Only one of the numbers is 5. That's one out of six or  $\frac{1}{6}$ .

The mathematical definition of probability is:

$$P(\text{event}) = \frac{\text{number of favourable possibilities}}{\text{total number of equally likely possibilities}}$$

1. Explain why the probability of rolling either a 5 or a 6 on a normal die is  $\frac{2}{6}$  or  $\frac{1}{3}$ .
2. Laura has a 12-sided die with one of each of the numbers 1 to 12 on each side. When Laura rolls her die, what is the probability she will roll:
  - a. a 7 ?
  - b. a number bigger than 7 ?
  - c. an odd number ?
  - d. an odd number or a number bigger than 8 ?
3. The bigger the probability the more likely an event is to happen. Which of these events is the more likely? Rolling a number bigger than four on a six-sided die or getting a 'head' when you toss a coin?
4. A pack of cards contains 52 cards arranged in 4 suites: Each suite contains numbers from 2 to 10 and a jack, queen, king and ace. All hearts and diamonds are red and clubs and spades are black. When you choose one card at random from a pack of cards what is the probability that it will be:
  - a. the 9 of spades
  - b. a heart
  - c. a king
  - d. a black card
  - e. a red queen
  - f. a red ace or a black jack.



5. There are 8 red discs and 10 black discs in a bag.
- Hassan is going to select a disc from the bag at random. Which colour, red or black, is he more likely to select?
  - What is the probability he will select:
    - a red disc?
    - a black disc?
    - a disc that is *either* red or black?
    - a disc that is *neither* red or black?
  - The first disc Hassan selected was red. He put the disc back in the bag then selected another disc at random. What is the probability he will select another red disc?
  - The next time Hassan selected a disc he got a black one. He didn't put the black disc back in the bag before he selected the next disc.
    - Explain why the probability of selecting another black disc is  $\frac{9}{17}$ .
    - What is the probability that he will select a red disc?



6. This table shows the possibilities when two coins are tossed together.

	Head (H)	Tail (T)
Head (H)	HH	HT
Tail (T)	TH	TT

- When two coins are tossed together what is the probability of getting:
  - two heads
  - a head and a tail
  - two things the same
- When you toss two coins together which is more likely, two heads or a head and a tail?
- If you toss a pair of coins 20 times, how many times would you expect to get:
  - two tails
  - a head and a tail



Created as a novelty promotion by Aristocrat, the Matilda was designed primarily for casinos in the USA, Europe and Asia, although a small number of the machines were used in NSW clubs. The seven-reel machine, the largest machine made in Australia, plays the tune of 'Waltzing Matilda' to announce a payout.

### Poker machines

Poker machines were imported to Australia as soon as they appeared in the United States a century ago. The early machines were totally mechanical and operated by means of levers and gears. Such mechanical machines later gave rise to electrical ones. In 1978 the Australian-made machines were the first to use computer technology.

In 1956, NSW became the first Australian state to permit the use of poker machines in registered clubs. Machines in NSW are required by law to be programmed at a player-return percentage of at least 85%. Therefore poker machines return more money to players than most of the popular forms of gambling. Yet, theoretically, poker machines must always come out ahead in the long run. Poker machines now account for the majority of the money gambled and lost in Australia. Most of the people who develop a gambling addiction play poker machines.

The key to poker machines' command of the gambling dollar lies in their style, process and design. Playing any poker machine is a game of chance — the outcome is always unpredictable. The chance is the same at any one time on a machine so there can be no play strategy. Poker machines will not become 'due' to 'loosen up' or 'dry up' because of past events such as near-misses or a long period without a big payout or a big recent payout.

On a machine with five reels and 35 possible stops on each reel, there are 52 521 875 possible stop combinations. It is often the case that the jackpot symbol is only assigned to one stop on each reel so there is only a 1 in 52 521 875 chance of hitting the jackpot in any one play.

The minimum player-return percentages of other forms of gambling are: 60% for Lottery, Lotto and Instant; 84% for TAB and on-course Tote.

### Language

- Totalisator: a machine that pools together all bets for each race and offer odds according to the betting market. With certain percentages deducted for the operators and the balance distributed as winnings, the operators can't lose.
- Player return percentage: the percentage of total bets expected to be returned to the player as winnings.

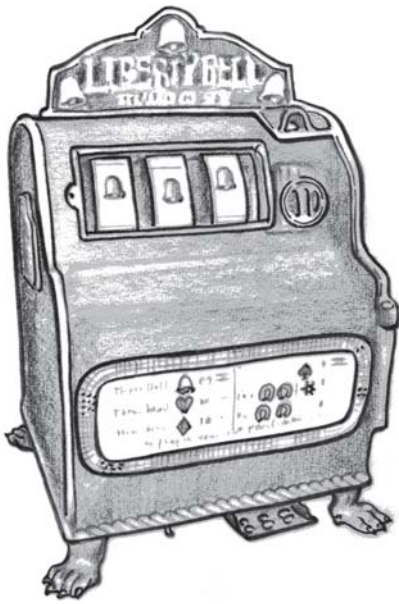
### Resource

- For information on how a poker machine works, visit <http://www.entertainment.howstuffworks.com/slot-machine4.html>
- PlaySmart brochure on 'Know your chances on the pokies' from [http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/1\\_english.pdf](http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/1_english.pdf)

### Did you know?

- George Adams, who became known as the man in the hat, loved horseracing and gambling. When he died in 1904 he left his gambling business, Tattersall's, in the hands of his four trustees. The trustees run the business and the profits are distributed to the staff and the beneficiaries of the will. Today Tattersall's is Australia's largest private company.
- It is illegal to play poker machines if you are under 18 years old.












The Liberty Bell is considered to be the forerunner of poker machines, its basic design continues to be used in mechanical gaming devices today.

### Poker machines





The first poker machines were mechanical. One early poker machine had three reels, each with ten pictures on them. Players pulled a handle and the reels spun around. The top prize, or jackpot, was paid when three bells lined up. Poker machines also pay out for a range of smaller prizes. This table shows the number of times each symbol was on a reel.

Symbol	Number of times on a reel
 Bell	1
 Hearts	2
 Spades	2
 Diamonds	2
 Horseshoes	3

1. What is the probability of the first reel showing:
  - a. a heart?
  - b. a horseshoe?
  
2. What is the probability of the second reel showing:
  - a. a bell?
  - b. a diamond?
  - c. a bus?
  
3. To calculate the probability of a particular display, the probability of each of the three reels is multiplied together.

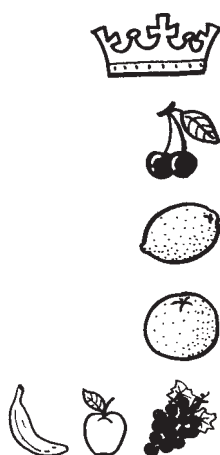
The probability of     
 is  $\frac{2}{10} \times \frac{2}{10} \times \frac{3}{10} = \frac{12}{1000}$

What is the probability of these results?

- a. 
- b. 
- c. 
- d. 

4. The top prize was paid for three bells.
  - a. What was the probability of spinning three bells?
  - b. Approximately how many times would you expect the top prize to be won:
    - i. in 1000 spins?
    - ii. in 10 000 spins
  
5. Early American poker machines returned an average of 75% of the money invested to players. In one week \$60 000 was put into the pokies in a club.
  - a. How much of the \$60 000 would you expect to be paid to players in prize money?
  - b. How much of the \$60 000 would the club and government take?

Modern Australian poker machines have up to five reels and more pictures on each reel than earlier machines. Instead of having mechanical reels a computer simulates the spinning reel.



	reel 1	reel 2	reel 3	reel 4	reel 5
<b>crowns</b>	1	1	1	1	1
<b>cherries</b>	5	5	4	3	3
<b>lemons</b>	4	4	4	3	2
<b>oranges</b>	2	2	2	2	2
<b>other symbols</b>	20	20	21	23	24
<b>total</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>

6. What is the probability of an 'other symbol' showing on the first reel?
7. What is the probability of 'other symbol' showing on all five reels at the same time? Answer as a decimal, correct to 3 decimal places.
8. Which is more likely: five cherries or five lemons?
9. The Jackpot prize is paid for five crowns.
  - a. Explain why the probability of winning the jackpot is 1 in 33 554 432.
  - b. On average the jackpot would be won once in 33 554 432 games. Imagine each game takes five seconds to play. How long would it take to play 33 554 432 games if you played 24 hours per day?



Lottery-type games remain the most popular form of gambling in Australia with 60% of adults participating.

## Scratch lottery tickets: Jackson's story\*

My uncle gave me a scratch lottery ticket for my 16th birthday. When I scratched it I won \$50. 'Wow', I thought. 'This is great!' I went to the local newsagency and cashed in the ticket. No one asked me how old I was. I bought two more \$5 tickets and put the \$40 in my wallet. When I got home I scratched the two tickets. I didn't win anything with the first one but I won \$20 with the second. 'How easy is this!' I thought.

I started buying more tickets. I went to different newsagencies so no one would know how many tickets I was buying, most didn't ask me if I was over 18.\* In the beginning I won on about half of the tickets. I guess it was just beginner's luck, because after a while I wasn't winning much, but I was sure a big win was getting close. I kept buying tickets and I'd scratch things like two \$50 000 and one \$5000. I was so close, I was convinced it was only a matter of a few more tickets and I'd win the big prize.

When I ran out of money I started stealing money from my mother's wallet and from other students at school. I'd fake being sick so I could get out of PE. When everyone else was involved in sport I'd go through bags and clothes to steal money. One day I nearly got caught trying to take money from one of the teachers' staffrooms. I said I was looking for my assignment book. They believed me and I was sure my luck had changed.

All I could think about was how to get the money to buy more tickets. I started being in trouble for not concentrating on my schoolwork and not doing my homework, but I wasn't interested in school stuff. I knew I wasn't really winning anything, but I couldn't stop buying tickets. I knew I needed help but I didn't know what to do. Then I got caught stealing money from bags in the library.

Jackson\*\*

\* You must be 18 years of age or older to buy lottery products (including scratch tickets). It is against the law to sell lottery products to a person who is under 18.

\*\* Jackson is not his real name.

### Language

- ‘Long’ odds — in gambling it implies there is little likelihood that the situation will happen and means a large payout if it does.
- ‘Short’ odds — means a small payout as it is thought there is much likelihood that the situation will happen.

### Resource

- Download the PlaySmart brochure on ‘Know the odds of your numbers coming up’ from [http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2\\_english.pdf](http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2_english.pdf)

### Did you know?

The chance of winning the top prize on a \$2 instant scratchie is **1 in 960 000**

The chance of winning Division One Oz Lotto with one game, by choosing all six winning numbers, is **1 in 8 145 060**

The chance of getting all five winning numbers plus the Powerball with a single 50 cent game is **1 in 54 979 155**

The chance<sup>5</sup> that your family would have your car stolen during the 12 months prior to April 2002 was **1 in 56**

The chance<sup>5</sup> that your house would be broken into during the 12 months prior to April 2002 was **1 in 21.1**

The chance<sup>5</sup> that you could die in a transport accident in 2000 was **1 in 9524.**

5. *Crime and safety*, Australian Bureau of Statistics, Australia, 2002.

## Scratch lotteries

### Are you joking?

A mathematician and a non-mathematician are sitting in an airport hall waiting for their flight. The non-mathematician has terrible flight panic. 'Hey, don't worry, it's just every 10 000th flight that crashes.' '1 in 10 000? So many? Then it surely will be mine!'

'Well, there is an easy way out. Simply take the next plane. It's much more probable that you go from a crashing to a non-crashing plane than the other way around. So you are already at 1 in 10 000 squared.'

[source: <http://www.ahajokes.com>]

1. There are 960 000 tickets sold in a \$2 scratch lottery.<sup>6</sup>
  - a. Calculate the total value of the tickets.
  - b. Write this amount in words.
2. Newsagents are paid 15 cents commission for each ticket they sell. How much commission is paid for the 960 000 tickets?

6. NSW State Lottery Office.

## What are the odds?

3. This table shows the number and value of the prizes in a scratch lottery.

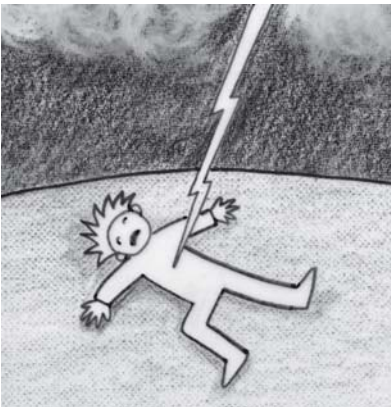
Complete the missing values in the table.

Value of prize	Number of prizes	Total prize money for these prizes
\$2	55 000	$2 \times 55\,000 = \$110\,000$
\$3	57 000	$3 \times 57\,000 = \$114\,000$
\$4	75 000	<b>a</b>
\$5	<b>b</b>	\$150 625
\$6	<b>c</b>	<b>d</b>
\$10	10 000	<b>e</b>
\$50	1 000	\$50 000
\$500	30	\$15 000
\$10 000	1	\$10 000
\$100 000	1	\$100 000
	<b>Total 255 907</b>	<b>Total f</b>

4. After the government pays the newsagents and the prize winners, how much is left as its share?
5. Who 'wins' the biggest prize in the \$2 scratch lottery?\*
6. What percentage of the total money from ticket sales does the government keep?
7. What is the probability of winning any prize in this \$2 scratch lottery?

\* The government also takes a predetermined percentage from one lottery.

8. Is it true that over 25% of people who buy tickets in this scratch lottery win a prize? Explain your answer.
9. What is the probability of a person who buys a ticket winning more than \$600 in this \$2 scratch lottery?
10. How many tickets sold in this \$2 scratch lottery:
  - a. don't win any prize?
  - b. don't win a prize worth more than \$600?
11. Imagine the name and address of all the people who bought tickets in the scratch lottery and didn't win the big prize of \$100 000 were written in a book. There would be 25 names to a page.
  - a. How many pages would be filled with the names of losers?
  - b. Maths textbooks have an average of 450 pages. How many books, the same size as maths textbooks, could be made from the pages of losers names and addresses?
12. The probability of winning varies between different scratch lotteries. The probability of winning a \$2 scratch lottery is 1 in 960 000 and the probability of being struck by lightning is 1 in 600 000. Which is more likely to happen to you? Winning a scratch lottery OR being struck by lightning?
13. Every week Hamish buys two \$5 scratch lottery tickets.
  - a. How much money does Hamish spend on scratch lottery tickets each year?
  - b. How many tickets will Hamish buy in 30 years?
  - c. The probability of winning a scratch lottery is 1 in 960 000. Is it very likely that Hamish will win first prize in a scratch lottery?
  - d. How much will Hamish spend on scratch lottery tickets in 30 years?
  - e. Use the formula  $A = \frac{520 [(1 + r)^n - 1]}{r}$  where  $n = 30$  and  $r = 0.05$  to calculate the money (A) Hamish would have after 30 years if he invested the money at 5% per annum. compound interest instead of spending it on scratch lottery tickets.
14. Read Jackson's story again. Imagine Jackson is someone you know.
  - a. How might you have known that Jackson had a problem?
  - b. You could have given Jackson the phone number 1800 633 635 for G-line, the problem gambling telephone counselling service. What else could you have done to help him?





This is the third and last lottery barrel used by NSW Lotteries. Almost three metres long, its career was short, superseded in the early 1980s by computerised random-number selection.

### Internet gambling: Michael's story

Each week my family buys a Lotto ticket and we watch the draw on TV. Our numbers are our ages and our birthdays. Mum said these numbers would be lucky for us. It's exciting watching the balls drop and hoping they will be our numbers. The family has won some small amounts of money but nothing big yet.

I have a computer connected to the internet in my bedroom and I like to surf the net. One night I found an overseas gambling site where I could play lotto on line. The trouble was that you had to have a credit card to play. I had money saved from my part-time job that I wanted to use, but I didn't think Dad would let me use his credit card. Even though I wanted to play, I knew I couldn't. So I tried to shut down the site. A few seconds after I shut the site, it came back asking me to play. I shut it down and it kept coming back. I thought this had to be a sign that I would win if I played. I decided to try. My plan was to use Dad's credit card and pay him for what I'd used plus surprise everyone with the money I'd won. So I took Dad's credit card number off one of his receipts and I started playing with \$100 credit.

I didn't win anything for a couple of games, then I thought, I'd paid for them, so I should keep playing. Then I won a \$15 then a \$10 and a \$20 prize. My luck was in. Then I changed my strategy. I decided that I should keep playing with the same set of numbers every time. I'd heard that I would be more likely to win this way. I kept playing and sometimes I was very close to winning. One time I got four numbers and all the other numbers were one off! I was so close I was sure I was going to win. One of my numbers is nine. In one game there was a 10 and an eight, so close to my nine. I was so sure I was going to win the big one that I used Dad's credit card number again and again.

I couldn't think about anything else except playing online and worrying about what I owed on Dad's card. I couldn't concentrate on my jobs at home and Mum started asking me what was wrong. I just couldn't tell her what I'd done and that now I owed Dad more than I could pay him. I just kept playing to try to win Dad's money back. Then Dad checked internet banking and saw what he called 'some unauthorised use of his card'. When he phoned the bank to complain about the \$400 I knew I was in big trouble.

Michael, \* age 15

\* Michael is not his real name.

### Language

When Americans use the word lottery they are talking about what Australians call Lotto.

### Resource

- Understand the mathematics behind lottery, visit <http://www.webmath.com/cgi/lottery>
- Download the PlaySmart brochure on 'Know the odds of your numbers coming up' from [http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2\\_english.pdf](http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2_english.pdf)

### Did you know?

Mathematicians do make approximations at times. The odds of anything less likely than 1 in 50 million can be regarded as nil or no chance. The chance of winning Powerball is 1 in 54 979 155.<sup>7</sup>

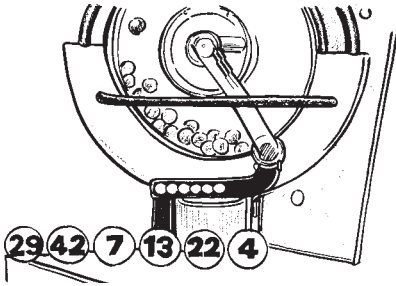
The Sydney Opera House was built from funds raised by lottery.

It is illegal to buy Lotto or lottery tickets if you are under 18.

7. *Gambling in Australia: thrills, spills and social ills*, Charles Pickett, Powerhouse Publishing, 2004, p 18.

### Lotto probability

When Michael was playing online lotto he was playing 6 in 40 lotto. He was trying to predict the six numbers that would be selected, as a group, from the numbers one to 40.



1. When the first lotto ball is selected explain why the probability that it is one of Michael's numbers is  $\frac{6}{40}$ .
2. If the first lotto ball was one of Michael's numbers, why is the probability that the next lotto ball will be one of Michael's numbers  $\frac{5}{39}$ ?
3. If the first two lotto balls are both two of Michael's numbers, why is the probability  $\frac{4}{38}$  that the third ball will be one of Michael's numbers?
4. If the first three lotto balls are all Michael's numbers, what is the probability that the next ball will also be one of Michael's numbers?
5. The probability that Michael selected the six winning numbers is  $\frac{6}{40} \times \frac{5}{39} \times \frac{4}{38} \times \frac{3}{37} \times \frac{2}{36} \times \frac{1}{35}$ .
  - a. How can you use your calculator to work out that this probability is  $\frac{1}{3\,838\,380}$ ?
  - b. What is this amount as a decimal?
6. The probability of being killed in a car accident if you travel 96 km without wearing a seatbelt is 1 in 1 000 000. How many times more likely is it that you will be killed when you travel 96 km in a car, without a seatbelt, than winning 6 from 40 lotto?
7. Michael always chooses the numbers 7, 9, 18, 23, 26 and 32 when he plays 6 from 40 lotto. Explain why these numbers have the same chance of winning as the numbers 10, 11, 12, 13, 14 and 15.
8. In the state of Massachusetts in the USA they play a 6 from 49 lotto game. The chance of winning this game is close to 1 in 14 million. Out of the 494 lotto games played between 1987 and 1994 only 77 have had winners.<sup>8</sup>
  - a. In what percentage of the games was there a winner?
  - b. In what percentage of the games did no one win?
9. The chance of winning Powerball is 1 in 54 979 155.
  - a. If you buy one ticket in Powerball what is the probability you won't win first prize?
  - b. Approximately how many different tickets would each of the 20 million people in Australia need to buy to make certain someone wins the game?



8. Massachusetts State Lottery Commission, 1994.



10. The hypothetical chance of a pregnant woman having quintuplets (5 babies) is 1 in 47 000 000. Which is more likely: a pregnant woman having quintuplets *or* winning Powerball?
11. This table shows the number of combinations of six, seven and eight balls that can be made choosing from 36 to 40 balls. For example, the table shows that there are 12 620 256 ways to choose seven balls from 38 balls.

Number of balls	Choose 6 balls	Choose 7 balls	Choose 8 balls
36	1 947 792	8 347 680	30 260 340
37	2 324 784	10 295 472	38 608 020
38	2 760 681	12 620 256	48 903 492
39	3 262 628	15 380 937	61 523 748
40	3 838 380	18 643 560	76 904 685

- How many ways are there to choose eight numbers from 38?
- How many more ways are there to choose eight from 37 than six from 37?
- What happens to the number of possible combinations as the number to be chosen increases?
- Which has more effect in increasing the number of possible combinations when you are choosing up to eight balls: increasing the total number of balls by 1 or increasing the number of balls to be chosen by one?



12. Imagine you are playing 6 from 45 lotto.
- Explain why the chance of winning is  $\frac{1}{8\,145\,060}$ .
  - If 9 000 000 people played one game in this 6 from 45 lotto, how is it possible for no one to win?
  - If 8 145 060 people played 6 from 45 lotto and everyone had a different set of numbers on their ticket
    - How many winners could there be?
    - How many losers would there be?

- iii.** If all the losers stood in a line and each person used 25 cm of space, how long would the line be?
- iv.** The road distance from Sydney to Broken Hill is 1012 km. Would the line of losers be shorter or longer than the return road trip from Sydney to Broken Hill?



Countess of Lovelace 1815–52.

## Calculating the odds doesn't always stop gambling: Ada Lovelace

Ada, Countess of Lovelace, the daughter of poet George Gordon Lord Byron, was an unusual woman for her time. Ada studied mathematics, had a deep interest in scientific and technological developments of the day and went on to become one of computing's colourful characters.

When her parents separated Ada was only a few weeks old and her mother, Lady Byron, decided to keep her away from poetry, the arts and anything that could make her like her 'wicked' father. Private governesses and tutors taught her daughter mathematics, science and languages.

As a member of the British aristocracy, Ada attended society affairs. At one of these parties she met Charles Babbage who interested her in his Difference Engine, the world's first fully automatic calculating machine. Ada understood how the machine worked and became great friends with its inventor. She went on to collaborate with Babbage on the development of his second machine the Analytical Engine which is now regarded as the first programmable computer. Ada wrote a paper that described the machine, gave instructions for its operation and speculated on its potential applications, gaining a reputation with some as the world's first computer programmer. In 1977, the US Department of Defense honoured her pioneering work in computing when they named their high-level, universal programming language ADA.

Ada had another passion in her life besides mathematics and computing. She loved horses and she loved gambling. Ada and her husband William both gambled on horses but following some large losses William gave up. Ada continued her gambling in secret. By the end of the 1840s she was borrowing money secretly to cover her losses. Even though she developed an algebraic betting system that was thought to be mathematically flawless, she lost huge amounts of money. On Derby Day in 1851 she lost 3200 pounds. On two separate occasions she pawned the Lovelace family diamonds to pay off gambling debts. On the second occasion her mother, Lady Byron, redeemed the diamonds and paid off all Ada's debts. Despite knowing the odds and understanding probability, Ada was unable to control her lust for gambling on horses.

On 27 November 1852, Ada died of cancer aged 36. At her request, and against the wishes of her mother, she was buried alongside her father, the father she was never able to get to know during her life.

### Language

People who gamble on horseraces are called 'punters' and the money the punters use for their bet is called a 'wager'.

### Resource

- For further information on Ada Lovelace, visit <http://www.sdsc.edu/ScienceWomen/lovelace.html> and <http://www.agnesscott.edu/lriddle/women/love.htm>
- For information on the difference engine or the analytical engine, see <http://www.powerhousemuseum.com/pdf/education/teachersnotes/cyberworlds.pdf>

### Did you know?

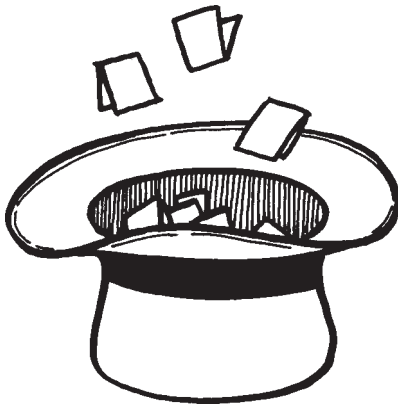
In setting odds, a bookmaker needs a good understanding of the condition of the horse, the jockey and the track; they also need to make the odds attractive to punters. The most important thing to know is that odds are set in the bookmaker's favour.

By comparison, with the automatic totalisator and the TAB, it's all maths. The machine adds up the amount wagered by the punters, works out the odds so that the total payout matches the amount wagered, minus the take of the tote and the government.

It is illegal to place bets on the TAB, the on-course tote or with bookmakers if you are under 18.



The thoroughbred racehorse, Grand Flaneur, was bred in 1877 by E K Cox at Fernhill in Penrith, New South Wales. Grand Flaneur was unbeaten on the racetrack and won the 1880 Melbourne Cup.



TAB LIMITED ABN 17 081 765 308  
Please check printed details

**TRIFECTA**  
**TG05 DEVONPORT**  
Tue 1 Apr 2004 at 14:12

7 GO GO WILL / 4 FLASH AMANDA/  
8 NIFTY NICK

ISSUED 1 APR 2004 14:12:59 5202622100



0346 RECEIPT TOTAL \$10.00

Valid for 12 months from date of event  
Is gambling a problem for you?

CALL G-Line(NSW) counselling service 1800 633 635.

## Horseracing

1. The formula  $A = 2.5 P (1.04)^n$  can be used to estimate today's value in Australian dollars of the £3200 Ada lost on Derby Day in 1851. Use the values  $P = 3200$  and  $n = 153$  in the formula to estimate today's value ( $A$ ) of the £3200.
2.
  - a. If Ada had put the names of the 18 horses in a race into a hat, then selected a name at random, what is the probability that she would have selected the name of the winning horse?
  - b. Why wouldn't every horse in the race have a probability of  $\frac{1}{18}$  of winning?
3. One way that people gamble on horses is with the TAB. Two ways to bet with the TAB are betting that a horse will win or betting that a horse will come a place (either 1st, 2nd or 3rd). All the 'win' bets for a race are placed in a 'win pool' and the 'place' bets are placed in a separate 'place pool'. For one race the win pool was \$1 500 000 and the place pool was \$7 450 000.
  - a. TAB takes 14.5% commission deduction from the win pool and 14.25% from the place pool. Out of the commission deduction, 19.11% goes to the state government, 9.09% to the commonwealth as GST, 28% goes to the racing industry and the rest is kept by the TAB. How much was the state government's share of both pools?
  - b. How much was left in the win pool to share among the winning punters?
  - c. There was the equivalent of 427 500 \$1-bets in the win pool. Explain why each \$1-bet will receive \$3 from the win pool.
4. When Hursties Girl won a race, the TAB paid \$3.25 for the win and \$1.65 for the place. Janette wagered \$5 on Hursties Girl for a win. How much will she receive from the TAB?
5. Trifectas are popular TAB bets. Punters place the first three horses in order in trifecta bets. The number of possible trifectas in a ten-horse race is  $10 \times 9 \times 8 = 720$ . Ten horses can win, nine horses are left to come second and eight horses to come third.
  - a. How many different trifectas are possible in an 18-horse race?
  - b. Nick thinks he knows which horse is going to win an 18-horse race. How many trifectas are possible with the horse that Nick thinks is going to win, winning?

6. Bookmakers use ratios to express the chance a horse will win a race. The ratios are called odds. The odds of 6:1 mean the horse has six chances of losing for every one chance of winning. The probability it will win is  $\frac{1}{7}$ .

a. Complete this table.

Odds	probability
6:1	$\frac{1}{7}$
6:4	$\frac{4}{10} = \frac{2}{5}$
3:1	i
5:1	ii
11:4	iii

- b. When the odds are '6:4 on' it means the order of the ratio has been swapped. A horse at '6:4 on' has six chances of winning for every four chances of losing. This is a probability of  $\frac{6}{10}$  or  $\frac{3}{5}$ . Jack Flash has odds of '7:4 on'. What is the probability Jack Flash will win?
- c. Go Go Will (4:1), Flash Amanda (7:4) and Nifty Nick (5:2) are three of the horses in an eight-horse race. Which of these three horses has the most chance of winning the race?
7. A horse's odds are used to calculate the money that the punter wins. When Jeff bet \$8 on a horse that won at 5:2 (=  $2\frac{1}{2} : 1$ ) he won  $\$2\frac{1}{2}$  for every \$1 of his bet. He won  $8 \times 2\frac{1}{2} = \$20$ . He will receive \$28 back from the bookmaker.

Say Pat bet \$12 on a horse at 5:1.

- a. How much will Pat win if the horse wins?  
 b. How much will he receive from the bookmaker if the horse wins?  
 c. How much will Pat lose if the horse doesn't win?  
 d. Which is more likely to happen? Rolling a four on a normal six-sided die or a horse winning at 5:1?



8. Rob placed a \$100 bet on every race at Randwick last Saturday. This table shows his results on each race.

Race number	Odds of Rob's horse winning	What happened?	How much did Rob win?	How much did Rob lose?
1	8:1	Rob's horse came last	Nil	\$100
2	15:1	Rob's horse came 5th	i	ii
3	5:2	Rob's horse came 2nd	iii	iv
4	6:4	Rob's horse won	v	vi
5	10:1	Rob's horse came 2nd-last	vii	viii
6	3:1	Rob's horse came 3rd	ix	x
7	2:1 ON	Rob's horse won	xi	xii
8	7:4	Rob's horse came 2nd	xiii	xiv

- a. Complete the last two columns in the table.
- b. How much did Rob lose?
- c. Rob started the day with \$1000 in his wallet. What is the most money he could have had in his wallet at the end of the day?



In this production still from the Australian film *The sentimental bloke*, the 'blokes' are playing the game of two-up.

### Gambling and social issues: try this quick quiz

Read the following statements then circle the ✓ if you think the statement is true, ✗ if you think it is false and ? for don't know.

✓  ✗  ?

1. On average, people in North America spend more on legalised gambling each year than do Australians.
2. Australian gamblers lose more than \$15 billion per year.
3. More than 75% of the money lost in gambling in NSW is lost on poker machines.
4. The government of NSW was the first Australian government to profit from lotteries.
5. In Australia less than 5% of money raised by state governments comes from lotteries and gambling taxes.
6. Adults are just as likely as high school students to develop gambling problems.
7. In Australia gambling on horses is the most popular gambling activity for problem gamblers.
8. A higher percentage of teenagers than adults have serious gambling problems.
9. More male than female high school students gamble regularly.
10. Levels of gambling in Australia haven't changed much in the past 20 years.
11. Less than 2% of Australian adults have a problem with gambling.
12. One in ten problem gamblers in Australia consider suicide.

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

✓  ✗  ?

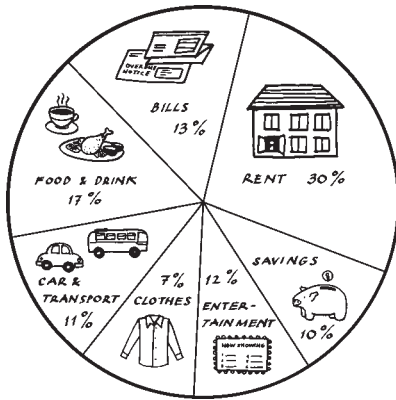
✓  ✗  ?

✓  ✗  ?

13. History shows people started gambling after 1200 AD.
14. The chance of winning Powerball is less than 1 in 54 million.
15. If you play the pokies and you reinvest all your winnings you will eventually lose all your original investment.
16. You are more likely to win at lotto if you use your 'lucky numbers'.

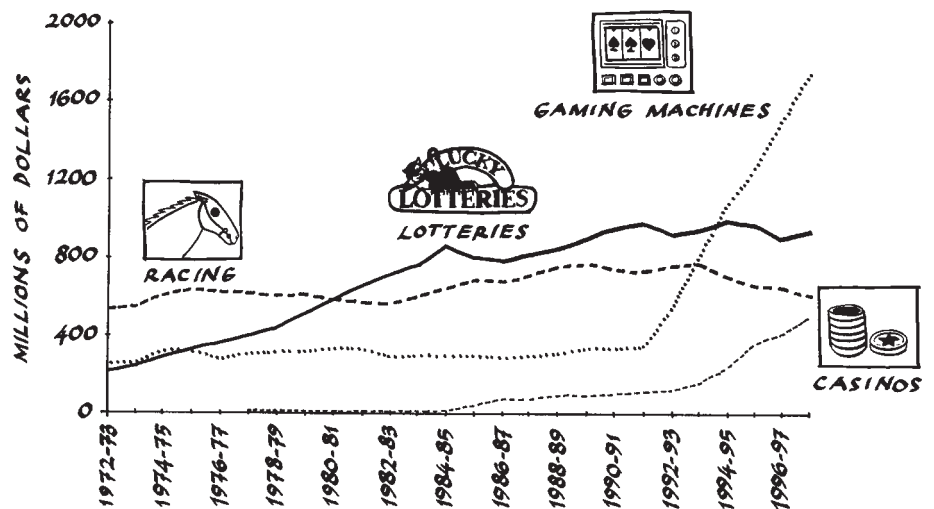
**Resource**

- To know how 'everyone can lend a hand for a better deal', visit [http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/5\\_english.pdf](http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/5_english.pdf)
- For a comprehensive review of Australia's gambling industries, refer to the Productivity Commission's 1999 inquiry report, *Australia's gambling industries* or visit <http://www.pc.gov.au/inquiry/gambling/finalreport/>



### Budgets and gambling

1. Christine made a budget. The sector graph (*left*) shows how she plans to spend her take-home pay.
  - a. Christine plans to save \$70 per week. How much is her weekly take-home pay?
  - b. How much is Christine's rent per week?
  - c. From which part of her budget should Christine take her money for gambling?
  - d. What is the maximum amount Christine's budget allows for gambling each week?
  - e. Suggest some things Christine won't be able to do if she spends the maximum amount her budget allows on gambling.
  
2. Last year Australia's 300 000 problem gamblers each lost an average of \$12 000.
  - a. What was the total amount lost by problem gamblers last year?
  - b. Every problem gambler has an emotional or financial impact on between five to ten people. Estimate the total number of people that are affected either emotionally or financially by problem gamblers.
  - c. The population of Australia is 20 million. What percentage of the population is effected either emotionally or financially, by problem gambling?
  
3. The graph shows the total money received by Australian state and territory governments from four forms of gambling, from 1972 to 1997.<sup>9</sup>



9. Taxation revenue, Australian Bureau of Statistics, Australia.

- a. Before 1980, which gambling activity provided the governments with the most money?
- b. For the years 1986 to 1991, rank casinos, gaming machines, lotteries and racing from largest to smallest revenue-raisers for the governments.
- c. Rank the four forms of revenue-raising from largest to smallest for 1994 to 1997.
- d. In 1991–92 one of the trends in the graph started to change. What happened in 1991 to bring about this change?
- e. Use the graph to estimate the total amount of money received by the governments in 1996–97 from the four gambling activities.
- f. What major problem would state and territory governments face if they restricted or made gambling illegal?

### Resource

- To know how 'you can choose a better deal' visit [http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2\\_english.pdf](http://www.dgr.nsw.gov.au/IMAGES/GAMING/PlaySmart/brochures/english/2_english.pdf)

### The costs of problem gambling

Problem gamblers face individual costs and they create costs for the community.

Information in ovals indicates costs to the individual problem gambler and the number of problem gamblers affected annually according to the National Gambling Survey undertaken in 1999.<sup>10</sup>

Information in rectangles indicates the maximum estimated cost to the community annually in millions of dollars.

### What you have to do (worksheet activity)

Working in pairs or small groups (with reference to the A3 worksheet), place the information in each oval and rectangle in the appropriate place on the 'Personal and community costs of problem gambling' master page. After you have completed the master page, answer the four questions below.

1. What percentage of the problem gamblers who considered suicide attempted suicide?
2. What fraction of the gamblers who appeared in court were sent to jail?
3. There are 290 000 adult problem gamblers in Australia. Would you expect the numbers in the ovals to add to 290 000? Give at least two reasons for your answer.
4. Calculate the total annual cost to the community of problem gambling. Express your answer in millions of dollars, correct to two significant figures.

### Resource

- Streetwize, 'Losing it' shows the devastating financial and emotional effects of gambling on families.
- Streetwize, 'Long odds' looks at the financial problems, isolation and depression experienced by compulsive gamblers and encourages them to use the counselling services available.

10. *Australia's gambling industries*, inquiry report, Productivity Commission, vol 3, December 1999.

### **G-line (NSW)**

G-line (NSW) is a 24-hour, seven days a week, crisis counselling, information and referral service for problem gamblers, families, friends, and other people in NSW.

During 2002–03, more than 13 000 people with a gambling problem, or who were concerned about family members or friends, or who wanted information about problem gambling called the helpline.

Qualified and experienced counsellors answer calls to G-line (NSW), and offer telephone counselling to assist callers who may be in crisis as well as callers who are unsure about whether they have a gambling problem. The families and friends of problem gamblers can also receive counselling by calling G-line (NSW). The service can assist with managing short and long-term behaviour of problem gamblers. G-line (NSW) can also assist callers to access face-to-face counselling through referrals to local services.

The service has access to a range of gambling and financial counselling and treatment services across NSW. In addition to telephone counselling, G-line (NSW) can provide callers with printed information about problem gambling.

The G-line (NSW) service caters for callers from non-English speaking backgrounds via the use of a 24-hour professional interpreter service. Referrals can also be made to face-to-face ethno-specific problem gambling treatment services. Hearing impaired callers can access the service by contacting a TTY number — 1800 633 649. All calls received at G-line (NSW) are treated with confidence.

Promotion of the service within the community occurs in a number of ways. For example, all gaming venues are required to display G-line (NSW) signage and have printed material available for patrons. A community awareness campaign — Unscrambling Problem Gambling — has been successful in drawing attention to G-line (NSW) and the services it provides.

## Answers

### Calculating probabilities

- There are 2 possibilities out of 6, that is  $\frac{2}{6} = \frac{1}{3}$
- a.**  $\frac{1}{12}$  **b.**  $\frac{5}{12}$  **c.**  $\frac{1}{2}$  **d.**  $\frac{8}{12} = \frac{2}{3}$
- Tossing a head
- a.**  $\frac{1}{52}$  **b.**  $\frac{13}{52} = \frac{1}{4}$  **c.**  $\frac{4}{52} = \frac{1}{13}$  **d.**  $\frac{26}{52} = \frac{1}{2}$  **e.**  $\frac{2}{52} = \frac{1}{26}$  **d.**  $\frac{4}{52} = \frac{1}{13}$
- a.** Black, there're more black discs than red **b. i.**  $\frac{8}{18} = \frac{4}{9}$  **ii.**  $\frac{10}{18} = \frac{5}{9}$   
**iii.**  $\frac{18}{18} = 1$  **iv.**  $\frac{0}{18} = 0$  **c.**  $\frac{8}{18} = \frac{4}{9}$  **d. i.** The bag now contains 8 red and 9 black discs. Probability of black is  $\frac{9}{17}$  **ii.**  $\frac{8}{17}$
- a. i.**  $\frac{1}{4}$  **ii.**  $\frac{2}{4} = \frac{1}{2}$  **iii.**  $\frac{2}{4} = \frac{1}{2}$  **b.** H and T **c. i.** 5 **ii.** 10

### Poker machines

- a.**  $\frac{2}{10} = \frac{1}{5}$  **b.**  $\frac{3}{10}$
- a.**  $\frac{1}{10}$  **b.**  $\frac{2}{10} = \frac{1}{5}$  **c.** 0
- a.**  $\frac{3}{10} \times \frac{2}{10} \times \frac{1}{10} = \frac{6}{1000}$  **b.**  $\frac{1}{10} \times \frac{1}{10} \times \frac{2}{10} = \frac{2}{1000}$  **c.**  $\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} = \frac{27}{1000}$   
**d.**  $\frac{2}{10} \times \frac{2}{10} \times \frac{2}{10} = \frac{8}{1000}$
- a.**  $\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{1000}$  **b. i.** 1 **ii.** 10
- a.** \$45 000 **b.** \$15 000
- $\frac{20}{32} = \frac{5}{8}$
- $\frac{20}{32} \times \frac{20}{32} \times \frac{21}{32} \times \frac{23}{32} \times \frac{24}{32} = 0.138$
- Cherries
- a.**  $\frac{1}{32} \times \frac{1}{32} \times \frac{1}{32} \times \frac{1}{32} \times \frac{1}{32} = \frac{1}{33\,554\,432}$  **b.** 5.3 years

### Scratch lotteries

- a.** \$1 920 000 **b.** one million, nine hundred and twenty thousand dollars
- \$144 000
- a.** \$300 000 **b.** 30 125 **c.** 27 750 **d.** 166 500 **e.** \$100 000  
**f.** \$1 116 125
- \$659 875
- The government
- 34.4%
- 0.267
- Yes
- $\frac{2}{960\,000} = \frac{1}{480\,000}$

10. a. 704 093 b. 959 998
11. a. 38 400 pages b. 85.33 books
12. Struck by lightning
13. a. \$520 b. 3120 tickets c. no d. \$15 600 e. \$34 548
14. Teacher to discuss with the class

### Lotto probability

1. There're 40 numbers and Michael has 6
2. There're 39 numbers and Michael has 5
3. There're 38 numbers and Michael has 4
4.  $\frac{3}{37}$
5. a. Many possible strategies, eg use fraction key, or cancel numbers in numerator and denominator b. 0.000 000 260 5
6. Approximately 3.8 times.
7. All numbers are equally likely
8. a. 15.6% b. 84.4%
9. a.  $\frac{54\,979\,155}{54\,979\,156}$  b. Approximately 2.7 tickets
10. Pregnant woman having quintuplets
11. a. 48 903 492 b. 36 283 236 c. They get much bigger d. Increasing the number of balls to be chosen by one
12. a.  $\frac{6}{45} \times \frac{5}{44} \times \frac{4}{43} \times \frac{3}{42} \times \frac{2}{41} \times \frac{1}{40} = \frac{1}{8\,145\,060}$  b. Some people pick the same numbers and no-one might pick the winning numbers c. i. 1 ii. 8 145 059 iii. 2036 km iv. 12 km longer

### Horseracing

1. \$3 229 913.56
2. a.  $\frac{1}{18}$  b. Some horses run faster than others
3. a. \$244 440.79 b. \$1 282 500 c.  $\frac{1\,282\,500}{427\,500} = \$3$
4. \$16.25
5. a. 4896 b. 272
6. a. i.  $\frac{1}{4}$  ii.  $\frac{1}{6}$  iii.  $\frac{4}{15}$  b.  $\frac{7}{11}$  c. Flash Amanda
7. a. \$60 b. \$72 c. \$12 d. Both have same probability
8. a. i. Nil ii. \$100 iii. nil iv. \$100 v. \$250 vi. nil vii. nil viii. \$100 ix. nil x. \$100 xi. \$159 xii. nil xiii. nil xiv. \$100 b. \$100 c. \$700

### Gambling and social issues quiz

1. **False.** Australians spend at least twice as much on average on legalised gambling as people in North America and Europe. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 12)
2. **True.** Judged on losses per capita, Australians are the world's leading gamblers. At \$15 billion per year, Australia's gambling losses exceed its household savings. (*Gambling in Australia: thrills, spills and social ills*, Powerhouse Publishing, 2004, p 2)
3. **True.** At 10–12%, poker machines offer one of the lowest house margins of the popular forms of gambling, yet they account for more than 75% of the amounts gambled and lost in NSW. (*Gambling in Australia: thrills, spills and social ills*, Powerhouse Publishing, 2004, p 12)
4. **False.** Tasmania was the first to state to decide to profit from lotteries rather than to prohibit them. (*Gambling in Australia: thrills, spills and social ills*, Powerhouse Publishing, 2004, p 4)
5. **False.** Today, about 12% of the government revenue raised by state governments comes from lotteries and other gambling taxes. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 8)
6. **False.** High school students are twice as likely to become problem gamblers than are adults. (Shaffer H J, et al, *Science and substance abuse education*, Harvard Medical School, 1995)
7. **False.** Problem gamblers spend 42.3% of their gambling money on gaming machines (pokies) compared to 33.1% on horses. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 22)
8. **True.** The percentage of teenagers who gamble that are problem gamblers is higher than the percentage of adults who gamble that are problem gamblers. (*Gambling education*, SA Department of Human Services, November 2002, p 3)
9. **True.** Teenage males gamble more than teenage females. (Shaffer H J, et al, *Science and substance abuse education*, Harvard Medical School, 1995)

- 10. **False.** Gambling is a big and rapidly growing business in Australia. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 2)
- 11. **False.** There are 290 000 adult problem gamblers, representing 2.1% of Australian adults. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 2)
- 12. **True.** One in ten [problem gamblers] said they had contemplated suicide due to gambling. (*Australia's gambling industries*, inquiry report, Productivity Commission, December 1999, vol 1: summary, p 2)
- 13. **False.** There is substantial evidence that people have been gambling for thousands of years.
- 14. **True.** The chance of winning Powerball is 1 in 54 979 155.
- 15. **True.** Poker machines don't return the full amount invested. Usually only 90% is returned. You can expect the machine to return 90% of your investment. When that's invested again the machine will return 90% of the 90% of the original investment. This table shows the proportion of the original amount left after winnings are reinvested.

After 1st investment	After 2nd investment	After 3rd investment	After 4th investment	After 10th investment	After 20th investment	After 30th investment
0.9	$(.9)^*=$ .81	$(.9)^*=$ .729	$(.9)^*=$ .656	$(.9)^{**}=$ .35	$(.9)^{**}=$ .12	$(.9)^{**}=$ .04

- 16. **False.** Every set of the same quantity of numbers has an equally small probability of winning.

**Budgets and gambling**

- 1. **a.** \$700 **b.** \$210 **c.** entertainment **d.** \$84 **e.** go to the movies, hire DVD
- 2. **a.** \$3 480 000 000 or \$3.48 billion **b.** Between 1 450 000 and 2 900 000 people **c.** Between 7.25% and 14.5%

3. a. racing b. lotteries, racing, gaming (poker) machines, casinos  
c. gaming (poker) machines, lotteries, racing, casinos  
d. The Victorian Government legalised poker machines  
e. \$3 400 000 000 or \$3.4 billion f. They would have to find another way to raise a lot of money

**The cost of problem gambling**

Matching information to master page

- |      |      |       |       |       |       |
|------|------|-------|-------|-------|-------|
| 1. b | 5. l | 9. p  | 13. q | 17. a | 21. j |
| 2. s | 6. n | 10. o | 14. c | 18. e | 22. v |
| 3. i | 7. r | 11. g | 15. u | 19. h | 23. w |
| 4. d | 8. t | 12. f | 16. k | 20. m |       |

24. 22.5%

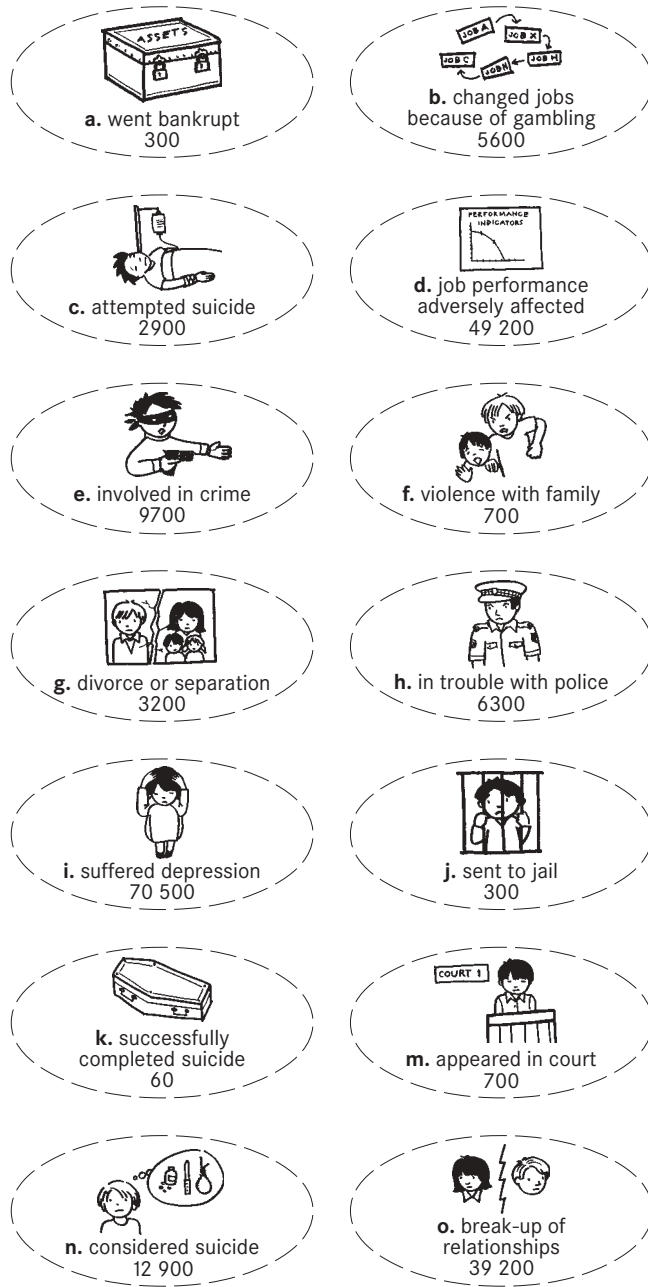
25.  $\frac{3}{7}$

26. No, some people may have been counted twice and others may not have been included at all.

27. \$5 600 million

# Worksheet

Information in ovals indicates costs to individual problem gamblers and the number of problem gamblers affected annually



Information in rectangles indicates the maximum estimated cost to the community annually in millions of dollars

