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Back to the books

GambleAware

NSW GOVERNMENT

Activity introduction

Quick summary

Sports betting is everywhere. Ads for gambling platforms dominate at sporting events. Big celebrities are promoting it. Even school children talk about sports in terms of odds and percentages.

Most Australians are involved with sports at some level, and this can create the illusion that our ability to predict results is greater than it really is.

The concern with young people is that exposure to gambling and gambling advertising puts them at risk of experiencing gambling harm as adults.

In this lesson, students will explore in more detail how bookmakers set odds, and how these odds are carefully determined in order to guarantee the bookmaker the best chance of making a profit.

Activity introduction

Learning intentions

Students will:

- understand how odds are calculated to be in the bookmaker's favour

- understand how bookmakers can manipulate the odds to increase profit

- understand that you cannot bet on both teams to win to guarantee a profit.

Syllabus outcomes

- **MAO-WM-01** develops understanding and fluency in mathematics through exploring and connecting mathematical concepts, choosing and applying mathematical techniques to solve problems, and communicating their thinking and reasoning coherently and clearly

- **MA5-PRO-C-01** solves problems involving probabilities in multistage chance experiments and simulations.

The identified Life Skills outcome that relates to this activity is **MALS-PRO-01** applies chance and probability to everyday events.

Capabilities and priorities

Numeracy
Critical and creative thinking
Ethical understanding

Topic
Gambling probability

Unit of work
Mathematics Stage 5

Time required
55 minutes

Level of teacher scaffolding
High - students will require strong scaffolding through the explicit instruction on calculating probabilities, but will be able to perform the tasks independently.

Resources required

- Appendix A: Bookmaker profits

- Appendix B: Gambler profits

- Calculators – one per student

Keywords
Gambling, betting, sports, casino, money, wellbeing, gaming.

Teacher worksheet

Teacher preparation

Gambling can be a high-risk activity and is a priority concern for young people. Therefore, before conducting the lesson on gambling, it is recommended that teachers read the Facilitator pack. The pack provides teachers and parents with essential information about gambling harm amongst young people and clarifies the nature of gambling-related behaviours and how to approach sensitive topics.

Learning intentions

Students will:

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- understand that you cannot bet on both teams to win to guarantee a profit.

Success criteria

Students can:

- convert between odds and probabilities

- calculate the expected profit or loss based on odds.

Teacher content information

In the Stage 4 lesson, *The wide world of sports betting*, we introduced a fictional bookmaker taking bets on the Unicorns and the Ferrets. Here we will revisit this bookmaker and learn more about how they can manipulate the odds in order to turn a profit.

Teaching sequence

30 minutes - Part A: Manipulating the odds

20 minutes - Part B: Manipulating the betters

5 minutes - Reflection

Part A: Manipulating the odds

Work through this resource material in the following sequence:

Step 1

Explain to your class that they will be investigating the actions of a rugby league bookmaker in order to learn more about how they can manipulate the odds of a game to make more money.

Step 2

Show students the table below.

Team	Odds
Unicorns	5.00
Ferrets	1.18

Ask students to explain what these odds mean.

The odds represents both the probability of the team winning, and the amount of money that could be won per $1 bet. If you bet on the Unicorns and they won, you could receive a payout of $5 for every $1 you stake. Remind your class that this is not the profit!

$$Profit = Payout - Stake$$

Continuing this example, your profit would actually be $4 per $1 bet.

Step 3

Explain to your class that the bookmaker has calculated (through their own means) the likelihood of each team winning, and is confident with their numbers.

Let's say they believe the Unicorns only have a 19% chance of winning, and the Ferrets have 81%. (Note that these add up to 100%, as it is assuming there cannot be a draw).

Have your class convert these percentages into odds (remember to convert percentages to probabilities by dividing by 100):

$$Unicorns: \frac{1}{0.19} = 5.26$$

$$Ferrets: \frac{1}{0.81} = 1.23$$

Step 4

Ask your class to compare these 'true' odds to the given odds.

- **What are the differences?**
  The true odds are higher than the given odds.

- **What does this mean?**
  The true odds represent the amount the bookmaker should be paying the punter for a win.

- **Why then is the bookmaker giving odds lower than the true odds?**
  Because they want to keep the extra for themselves.

Step 5

Remind students that bookmakers, like all casinos, have designed a system that is guaranteed to make them a profit. They expect to pay out some gamblers as winners - otherwise no one would ever gamble - but are also certain they are going to keep more than they give away. Otherwise why would they be bookmakers?

As a class, discuss how this system works. Prompt student thinking by asking:

- **Are the Ferrets guaranteed to win every game?**
  The bookmaker has already shown they believe the Ferrets are an 81% chance, but that's not certain. Anything could happen on the day of the match, and the Unicorns could pull off a remarkable victory.

- **Will absolutely every gambler bet on the Ferrets? Why or why not?**
  They won't, because some will be tempted by the possibility of a big payout ($5 for every $1 wagered) if the Unicorns manage to win.

- **How does the bookmaker expect to make a profit if they have to pay out everyone who gambles on the Ferrets, and they win, as expected?**
  The bookmaker is counting on enough people being tempted by the Unicorns' odds, and losing that money. We've already determined that the bookmakers are paying out 5c or 4.75% less than they should on a Ferrets win. So they are rewarding winning gamblers, but keeping the difference as profit.

- **How does the bookmaker expect to make a profit if they have to pay out everyone who gambles on the Unicorns and wins big?**
  Remember that it is still a possibility, though very unlikely. It is the worst case scenario for the bookmaker, but they're still confident of making a profit.

Step 6

Explain to students that the bookmaker needs to mitigate their risk by having the bets shared between the two teams.

The bookmaker needs to ensure that people bet in a certain way.

What the bookmaker needs is for the people to bet proportionally based on the 'true' odds of the game. In other words, they want 19% of people to bet on the Unicorns, and 81% to bet on the Ferrets.

Step 7

Independently, students complete the table found in Appendix A: Bookmaker profits.

The answers have been included here for your convenience. It shows what would happen if 100 people make $100 bets in those proportions:

Team	Number of bettors	Total amount wagered	Odds	Total Winning payout	Bookmaker profit
Unicorns	19	$1,900	5.00	$9,500	$10,000 - $9,500 = $500
Ferrets	81	$8,100	1.18	$9,558	$10,000 - $9,558 = $442
Total:	100	$10,000	-	-	

Step 8

As a class, discuss the results.

If the Unicorns win, the bookmaker will make a profit of $500.

If the Ferrets win, the bookmaker will **still** make a profit of $442!

Step 9

Your class might ask what happens if people don't bet in the required proportions, ie: what if 95% of people felt the Ferrets were going to win.

Good question.

Part A: Manipulating the odds

Independently, students calculate the bookmaker's expected profit with these new values. Instruct students to reuse Appendix A and change the values.

Team	Number of bettors	Total amount wagered	Odds	Total Winning payout	Bookmaker profit
Unicorns	5	$500	5.00	$2,500	$10,000 - $2,500 = $7,500
Ferrets	95	$9,500	1.18	$11,210	$10,000 - $11,210 = -$1,210
Total	100	$10,000	-	-	

Step 10

As a class, discuss the results.

In this case, the bookmaker is going to be thrilled if the Unicorns win. But remember, they don't think this is very likely.

And on the other hand, if the ferrets win, the bookmaker is going to be giving away money - which is something they absolutely do not do.

Step 11

So ask students, how do bookmakers avoid making a loss?

They adjust the odds, in order to balance things out once more. Students would have seen this happening in real time during sporting matches. The more likely a team is to win, for instance because they have already scored more goals or because the other team has had a player sent off, the 'shorter' their odds become, and the less payout for gamblers.

Bookmakers can also adjust the odds in order to attract new bettors in such a way as to balance things out once more, encouraging more gamblers to bet on the Unicorns at greatly increased odds. This isn't a risk for the bookmaker, as they are becoming less likely by the minute to win, and even if they do score totally improbably in the last second of the match, the bookmaker is secure in the knowledge they have adjusted the odds on the Ferrets to cover the huge payout on the Unicorns.

Step 12

Challenge students to shorten the odds themselves on the third blank table on Appendix A to create a system whereby the bookmaker profits regardless of whether the Ferrets or the Unicorns win in the above scenario.

Part B: Manipulating the bookmakers

Step 1

Can gamblers design a system the same as the bookmakers' where they also make a profit no matter the outcome of a match?

Step 2

Before jumping into some calculations, discuss as a class what might be a good approach to this system, and the challenges that might come with these systems. Suggestions might include:

1. **Put an equal amount on both teams to win.**
   Even without doing the calculations, most students should be able to see that a Ferret win would not cover out bets.

2. **Put a different amount on each team.**

3. **Only gamble on 'close' matches.**

Step 3

Independently, using Appendix B: Gambler profits, students calculate the expected profits if they were to put $100 on each team to win at the original odds in a few different scenarios.

Step 4

As a class, discuss your findings. Some suggested answers have been provided for your convenience.

1. **Put an equal amount on both teams to win.**

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns	$100	5.00	$500	$500 - $200 = $300
Ferrets	$100	1.18	$118	$118 - $200 = -$82

If the Unicorns win (unlikely) the gambler will profit, but if the Ferrets win (as expected) the gambler will not make enough on the short odds to cover their covering bet on the Unicorns.

Part B: Manipulating the bookmakers

Their overall expected value is then:

Outcome	Probability of outcome	Money won	Product
Unicorns	19%	$300	$57
Ferrets	81%	-$82	-$66.42
		Expected value (sum of products):	-$9.42

A loss of $9.42 might seem small, but it *never* makes sense to make a bet when the expected value is a loss.

2. Put a different amount on each team.

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns	$50	5.00	$250	$250 - $200 = $50
Ferrets	$150	1.18	$177	$177 - $200 = -$23

Same result as above. There's no combination of bets that will cover the other, as the odds are simply too small on the favourite - just as the bookmaker designed.

3. Only gamble on 'close' matches.

Imagine that the Unicorns and Ferrets are roughly equal teams, so the odds reflect that:

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns	$100	1.94	$194	$194 - $200 = -$6
Ferrets	$100	1.90	$190	$190 - $200 = -$10

Even worse!

Reflection

Setting a betting limit is an excellent way to restrict gambling losses. It takes mental fortitude however, so you must be committed to not going over it. How could you determine a betting limit? Should you base it on an amount of money that you are willing to lose? Should it be based on how much you stand to win?

If you passionately support a team, do you think you would bet on them to win even if they had very little chance? How can emotions affect the way in which people bet on sports?

Teacher reflection

Take this opportunity to reflect on your own teaching:

What did you learn about your teaching today?

What worked well?

What didn't work so well?

What would you share?

Where to next?

How are you going to get there?

Appendix A: Bookmaker profits

This table shows the results of 100 each betting $100 on the outcome of this match.

To find the winning payout, multiply the total amount wagered by the odds.

To find the bookmaker profit in the case of the Unicorns or the Ferrets winning, subtract the total winning payout from the total amount wagered on the match ($10,000).

Team	Number of bettors	Total amount wagered	Odds	Total Winning payout	Bookmaker profit
Unicorns	19		5.00		
Ferrets	81		1.18		

More people have bet on the Ferrets than was originally expected. Try changing the odds so that the book-maker still makes a profit, regardless of which team wins.

Team	Number of bettors	Total amount wagered	Odds	Total Winning payout	Bookmaker profit
Unicorns	5				
Ferrets	95				

Team	Number of bettors	Total amount wagered	Odds	Total Winning payout	Bookmaker profit
Unicorns	5				
Ferrets	95				

Appendix B: Gambler profits

To find the winning payout, multiply the total amount wagered by the odds.

To find the gambler profit in the case of the Unicorns or the Ferrets winning, subtract the total winning payout from the total amount wagered on **both teams**.

1. **Put an equal amount on both teams to win.**

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns		5.00		
Ferrets		1.18		

2. **Put a different amount on each team.**

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns		5.00		
Ferrets		1.18		

3. **Only gamble on 'close' matches.**

Team	Total amount wagered	Odds	Total Winning payout	Gambler profit
Unicorns		1.90		
Ferrets		1.80		