# Home ground advantage

Students develop an understanding of conditional probability through the analysis of the win rate of a chosen sport team, given that the team played at their home ground.

Students will need at least one digital device per pair during this lesson.

## Visible learning

This lesson incorporates Path content.

### Learning intention

* To be able to solve problems involving conditional probabilities.

### Success criteria

* I can interpret conditional probabilities.
* I can calculate conditional probabilities.
* I can construct if...then... statements.

### Syllabus outcomes

A student:

* 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 **MAO-WM-01**
* solves problems involving Venn diagrams, 2-way tables and conditional probability
**MA5-PRO-P-01**

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## Activity structure

Please use the associated PowerPoint *Home ground advantage* to display images in this lesson.

### Launch

1. Facilitate a class discussion, asking students:
* Have you heard of home ground advantage?
* What do you think it means?
* Do you believe it affects the outcomes of sports games?
* If you play sport, do you feel that home ground advantage has affected your games?
1. Print and distribute Appendix A ‘Home ground advantage’ on A3 paper, 1 between each pair of students.
2. In a Think-Pair-Share ([bit.ly/thinkpairsharestrategy](https://bit.ly/thinkpairsharestrategy)), students are to write a list of things they notice and wonder ([bit.ly/noticewonderstrategy](https://bit.ly/noticewonderstrategy)) about the data in the table.
3. Using a questioning strategy such as Pose-Pause-Pounce-Bounce (PDF 557 KB) ([bit.ly/posepausepouncebounce](https://bit.ly/posepausepouncebounce)), have students share what they noticed and wondered, creating a class list on the board.
4. Have pairs brainstorm reasons why some teams seem to benefit more from home ground advantage than others.

### Explore

1. Students select a sports team they are interested in where the fixture includes home and away games.
2. Students record their team’s home and away wins for the most recent season in a 2-way table. An example is shown in Table 1.

Table 1 – 2-way table

|  |  |  |  |
| --- | --- | --- | --- |
|  | Home | Away | Total |
| Win |  |  |  |
| Loss |  |  |  |
| Total |  |  |  |

1. Ask students to consider what they notice and wonder about the data they collected.
2. Students return to their pair from the Launch activity and compare the results of their tables.
3. Randomly select students to share what they discussed with their partner.

### Summarise

1. Use slides 3–4 of the *Home ground advantage* PowerPoint to provide students with definitions, language and notation associated with conditional probability.
2. Use slides 5–12 of the *Home ground advantage* PowerPoint for the explicit teaching of calculating probabilities of conditional events.

The explicit teaching technique used in the PowerPoint is ‘Your turn’. The first slide is a worked example which should be displayed for the students before using the following steps.

1. Reveal the question to students and its solution.
2. Students read in silence.
3. Students individually explain to themselves what is happening in each step.
4. Students hold a thumbs up to the teacher when they have finished reading and have some sort of understanding.
5. Think-Pair-Share. Students explain the solution to their partner.
6. In pairs, students then answer the self-explanation questions.
7. Finally, randomly select students to share their answers with the whole class.
8. Students apply their learning from the explicit teaching to calculate the following probabilities from their table in the Explore section:
9. In a Think-Pair-Share, have students compare their probabilities.

### Apply

1. With one digital device between pairs, direct students to [bit.ly/givenprob](https://bit.ly/givenprob).

In the applet there are 2 possible events that can occur. A ball falling could either hit the red shelf (event A) or hit the blue shelf (event B) or both. By exploring the applet, students will develop a visual understanding of conditional probability.

1. Display the applet and drag P(A) so that it is equal to 1.00. In a Think-Pair-Share, students discuss:
* What do you notice?
* What is the probability that a ball passes through the red shelf?
* What is the probability that a ball passes through the blue shelf?
* If a ball passes through the blue shelf, what is the probability it also hit the red shelf?
1. Allow students to freely play with the interactive to complete the ‘If… then…’ statements below:
* If the red shelf is 1.00, then …
* If the blue shelf is 1.00, then…
* If the red shelf and blue shelf are equal, then…
* If , then…
* If , then…
* If , then…

Allow for a variety of responses to the ‘If… then…’ statements. Students could respond with words, pictures, or probabilities. The goal is for students to make sense of what can be an otherwise abstract concept.

## Assessment and differentiation

### Suggested opportunities for differentiation

**Explore**

* Students can use the AFL data provided in Appendix A rather than finding their own data.
* Students can design and conduct simulations to model the effects of home ground advantage on game outcomes.
* Students can analyse historical data to investigate home ground advantage over time.

**Summarise**

* Students can look at this year’s fixture for their chosen sport and determine if the fixture is fair.
* Students can explore other factors that might influence wins. For example, weather, day versus night games, day of the week, important players missing.
* Student data sets should be unique, so that students can support their peers in finding each probability.
* Students can continue to use written language rather than conditional probability notation.

**Apply**

* The online manipulative could be modelled using concrete manipulatives, such as rulers, to allow students to experience conditional probability firsthand.
* Challenge students to create their own if… then… statementsbased on the shelves.

### Suggested opportunities for assessment

**Explore**

* Teachers can observe student contributions to class discussions to evaluate their understanding of 2-way tables.

**Summarise**

* Teachers can collect or observe students applying their learning from the explicit teaching to find each probability for their own data sets.

**Apply**

* Teachers can collect or observe student responses to the ‘If… then…’ statements.
* Teachers can pose an ‘If.. then..’ statement to the class to complete as a Think-Pair-Share to conclude the lesson.

## Appendix A

### AFL 2023 home and away wins

|  |  |  |
| --- | --- | --- |
| Team | Home win | Away win |
| Brisbane |  |  |
| Geelong |  |  |
| Gold Coast |  |  |
| Adelaide |  |  |
| Hawthorn |  |  |
| Essendon |  |  |
| Melbourne |  |  |
| Port Adelaide |  |  |
| Collingwood |  |  |
| Richmond |  |  |
| North Melbourne |  |  |
| West Coast |  |  |
| Fremantle |  |  |
| St Kilda |  |  |
| Sydney |  |  |
| Western Bulldogs |  |  |
| GWS |  |  |
| Carlton |  |  |

## Sample solutions

### Apply – If… then… statements

* If the red shelf is 1.00, then…

 will be 100%. Because if a ball has hit the blue shelf, then we know it definitely hit the red shelf. There could be some balls that hit the red shelf but not the blue so will not be 100%.

* If the blue shelf is 1.00, then…

 will be 100%. The reverse of the previous answer.

* If the red shelf and blue shelf are equal, then…

. Because if a ball hits the red shelf, it must also hit the blue shelf.

* If , then…

The shelves have no overlap. This means each conditional probability will also be 0.

* If , then…

The red shelf must be larger than the blue shelf.

* If , then…

The blue shelf must be larger than the red shelf.

## References

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