*A problem-solving and modelling task suitable for students working with* ***percentages and statistics (Focus: compare % and histograms)***

**Modelling Northern Qld**

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**QCAA approach to problem solving and mathematical modelling**

(<https://www.qcaa.qld.edu.au/downloads/portal/syllabuses/snr_maths_methods_19_syll.pdf>)

**What does a Home Ground Advantage mean for the NQ Cowboys?**

Australian curriculum content descriptors:

Year 9

Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources [(ACMSP228)](http://www.scootle.edu.au/ec/search?accContentId=ACMSP228)

Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including ‘skewed’, ‘symmetric’ and ‘bi modal’ [(ACMSP282)](http://www.scootle.edu.au/ec/search?accContentId=ACMSP282)

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**What does a Home Ground Advantage mean for the NQ Cowboys?**

Modelling Northern Qld

1. Do you think the NQ Cowboys are more likely to win games played in Townsville, versus other locations? State your opinion based on what you’ve heard in the local media or from family and friends.

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1. What impact do you think a home ground advantage has for a sporting team? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Research & Formulate

Let’s gather some information about the North Queensland Cowboys best season ever. In 2015, the Cowboys won the NRL premiership (best in the country!) so it’s a good year to see if they had any particular advantage at home.

The North Queensland Cowboys played 24 Games in the 2015 Season. Twelve of those games were played at Dairy Farmers Stadium in Townsville (home ground) and the other twelve were played away from their home ground (Brisbane, Sydney etc). The location and points scored for each Cowboys game are listed in the table on the next page.

1. Look at the list below. Circle the information that you can gather from the table on the next page. Cross out any information that you can’t access from the table.

Game number Minutes that Johnathan Thurston spent on the field

Name of the opposing team Points scored by the opposing team each game

Did the cowboys win the game? Points scored by the Cowboys each game

The average height of the players Whether a game was played at home or away

Date of each game Winning margin (difference between winning & losing score)

Number of wins for the whole season Number of losses for the whole season

1. Find a game when the Cowboys won convincingly (by a long way): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Find a game when the opposing team didn’t manage to get any points in the whole game: \_\_\_\_\_\_\_\_\_\_\_\_\_
3. Now that you know what information you do and you don’t have, think about **which information might be useful** and what calculations you could do with that information to **find out more about a home ground advantage**.

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| **NRL Season2015** | **Game 1** | **Game 2** | **Game 3** | **Game 4** | **Game 5** | **Game 6** | **Game 7** | **Game 8** | **Game 9** | **Game 10** | **Game 11** | **Game 12** | **Game 13** | **Game 14** | **Game 15** | **Game 16** | **Game 17** | **Game 18** | **Game 19** | **Game 20** | **Game 21** | **Game 22** | **Game 23** | **Game 24** |
| **Home (H)or Away (A)** | H | H | A | H | A | A | H | A | H | H | A | H | A | A | H | A | A | H | H | A | H | A | A | H |
| **Points scored FOR NQ Cowboys** | 4 | 14 | 22 | 18 | 30 | 30 | 28 | 26 | 23 | 31 | 8 | 18 | 36 | 21 | 18 | 18 | 30 | 46 | 32 | 18 | 18 | 50 | 6 | 42 |
| **Points scored AGAINST NQ Cowboys**  | 28 | 16 | 44 | 17 | 10 | 12 | 24 | 24 | 16 | 20 | 0 | 14 | 30 | 20 | 24 | 12 | 12 | 4 | 24 | 30 | 31 | 16 | 14 | 12 |

**Percentages** are a good way to compare the Cowboys’ performance at home and away (you may have thought of others). We’ll use some percentage calculations to see how the home ground advantage might help the NQ Cowboys.

Solve

1. Let’s look first at wins and losses for each game.
2. How many **home games** did the Cowboys win in the 2015 season? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How many **away games** did the Cowboys win in the 2015 season? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Remembering from earlier that the Cowboys played 12 home and 12 away games in the season, calculate the percentage of home games won (as a percentage of the total home games they played):

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1. Now calculate the percentage of away games that the Cowboys won.

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1. Comparing your results for parts c) and d), would you say that the Cowboys tended to win more often when they played at home? Did they tend to lose more often when they played at home? Or maybe it didn’t really make a difference in 2015? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Let’s look at the data in more detail using back-to-back stem and leaf plots.
3. Using the information in the table provided earlier, construct a back-to-back stem and leaf plot of the points that **the Cowboys have scored (points FOR)** in their HOME vs their AWAY games.

Cowboys attack for 2015

Home games Away games

1. Describe the shape of the graph on each side in terms of symmetry or skewness.

Home games \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Away games \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The graph you have created compares the Cowboys’ attacking prowess at their home and away games. Would you say that there is any evidence of a home ground advantage for Cowboys when they attack? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Now construct a back-to-back stem and leaf plot of the points that **the points scored by the opposition teams (points AGAINST)** in the Cowboys’ HOME and AWAY games.

Cowboys defence for 2015

Home games Away games

1. Describe the shape of the graph on each side in terms of symmetry or skewness.

Home games \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Away games \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The graph you have created compares the Cowboys’ ability to defend at their home and away games. Note that the *fewer* points scored against a team, the *better the defence*. Would you say that there is any evidence of a home ground advantage for Cowboys when they defend? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Looking at your results for wins/losses and points scored and defended, is there any evidence to say that playing at ‘home’ was more likely to result in a better performance by the Cowboys? Use your earlier results to justify your answer.

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Evaluate & verify

1. What other factors do you know of that could affect a team’s performance at an away game? For example, if the NQ Cowboys had to travel to New Zealand in July for a game, what factors might affect their performance? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. If a journalist from Sydney argued that “The Cowboys should play all their games in Sydney because it’s too hot to play in Townsville and they’re just as likely to win anyway”, how would you respond? To make a strong argument about why the Cowboys should be able to play their games at their home stadium, include the best calculations you have that back up your argument.

Communicate

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Sources for local information: <http://www.rugbyleagueproject.org/seasons/nrl-2015/north-queensland/summary.html>

**EXTENSION: Do the same trends you found in the regular season exist in the finals???**

Evaluate & verify

Below is additional information regarding the “Finals” played by the NQ Cowboys in their 2015 Premiership Season. The Finals series comprised four additional matches as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NRL Season2015** | **QualifyingFinal** | **SemiFinal** | **PreliminaryFinal** | **Grand Final** |
| Home (H) or Away (A) | A | H | A | A |
| Points scored FOR NQ Cowboys | 12 | 39 | 32 | 17 |
| Points scored AGAINST NQ Cowboys  | 16 | 0 | 12 | 16 |

1. Using this additional data and the main table provided earlier, complete the table below to calculate the average points (the mean points) scored FOR and AGAINST comparing home and away games in the regular season and the final series.

|  |  |  |
| --- | --- | --- |
|   | NQ Cowboys 2015 NRL Season**Home & Away Season (24 matches)** | NQ Cowboys 2015 NRL Season**Finals series (4 matches)** |
|   | Combined Home & Away games | Home Games | AwayGames | Combined Home & Away games | Home Games  | AwayGames |
| Average (mean) Points scored FOR Cowboys |   |   |   |   |   |   |
| Average (mean) Points scored AGAINST Cowboys |   |   |   |   |   |   |

1. Looking at “Average points scored FOR Cowboys” calculated in the table above, write a statement about the Cowboys scoring performance (their attack) at difference locations (better at home? worse at home? no significant difference?). Support your statement with calculations from your table.
2. Looking at “Average points scored AGAINST Cowboys” calculated in the table above, write a statement about the Cowboys defensive performance (limiting the points scored against them) at difference locations (better at home? worse at home? no significant difference). Support your statement with calculations.
3. Explain any limitations in calculating a meaningful average from the four game finals series. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_