

SPORTS SALARIES

Lesson 2: Working with a Salary Cap

Australian Curriculum: Mathematics (Year 8)

ACMSP206: Explore the practicalities and implications of obtaining data through sampling using a variety of investigative processes.

ACMSP207: Investigate the effect of individual data values, including outliers, on the mean and median.

ACMSP284: Investigate techniques for collecting data, including census, sampling and observation.

ACMSP293: Explore the variation of means and proportions of random samples drawn from the same population.

Lesson abstract

Students are provided with NBA teams' salary data. They graph the spread of salaries in a single team and calculate the mean and median salaries. Students discuss how real NBA team data differs from their randomly sampled teams.

Mathematical purpose (for students)

We will explore how a salary cap affects the salaries of NBA players in a single team.

Mathematical purpose (for teachers)

Students are given a dataset containing the salaries of NBA players in a single team, graph their data, and calculate mean and median. They compare the data of these real NBA teams to their randomly sampled teams in Lesson 1 and see that there is significantly less variation. They justify why this might be.

Suggested presentation 1-2 lessons of one hour each

Vocabulary encountered Lesson materials

- | | |
|-----------------|---------------------------------------|
| • mean | • 2a NBA Teams PDF; or |
| • median | • 2b NBA Salaries by Team Spreadsheet |
| • outlier | • Post-it notes |
| • random sample | |
| • spread | |
| • variation | |

Note: This lesson can be conducted either using printed worksheets or in Microsoft Excel, as suits your class.

We value your feedback after this lesson via our website.

Introduction

Review the class findings from Lesson 1, in particular focusing on the *spread* of the mean and median team salaries and the *variation* exhibited in the random samples.

Explain that in reality, the NBA has a *salary cap*—there is a limit to the total amount of money a team can pay its players. If a team goes over the salary cap they have to pay fines. The salary cap for the NBA 2016-17 season was \$94,143,000. Discuss why a salary cap might be necessary.

Teacher Notes

- A salary cap stops the wealthiest teams from buying all of the best players. It maintains parity between teams.

Ask: can you predict what the spread of salaries in a team might look like if there is a salary cap? How might players with outlier salaries affect the composition of the whole team?

Possible Student Responses

- There might be one or two players who are paid highly and then everyone else would be paid lower.
- Everyone might get a medium size salary.
- There could be two or three people with low salaries and two or three people with high salaries and then everyone else in the middle.

Compare this to the spread of the randomly generated teams in the previous lessons. It is likely that the salaries of randomly generated teams were more evenly spread.

Explain that you will be repeating the investigation from the previous lesson, but this time using real NBA teams. Each student will be given a list of players from a real NBA team and their salaries.

Investigation

There are two options for providing each student with a real NBA team:

- *2a NBA Teams* PDF contains 30 student sheets listing the players and salaries of different NBA teams.
- *2b NBA Salaries by Team* Excel file is a workbook containing 30 sheets, each with the data for a different NBA team. Each student will need to open the file and select a different team to work with.

Students create a data display showing the spread of player salaries in their team. You may ask students to use stem-and-leaf plots, histograms, dot plots or alternatives as appropriate for your class.

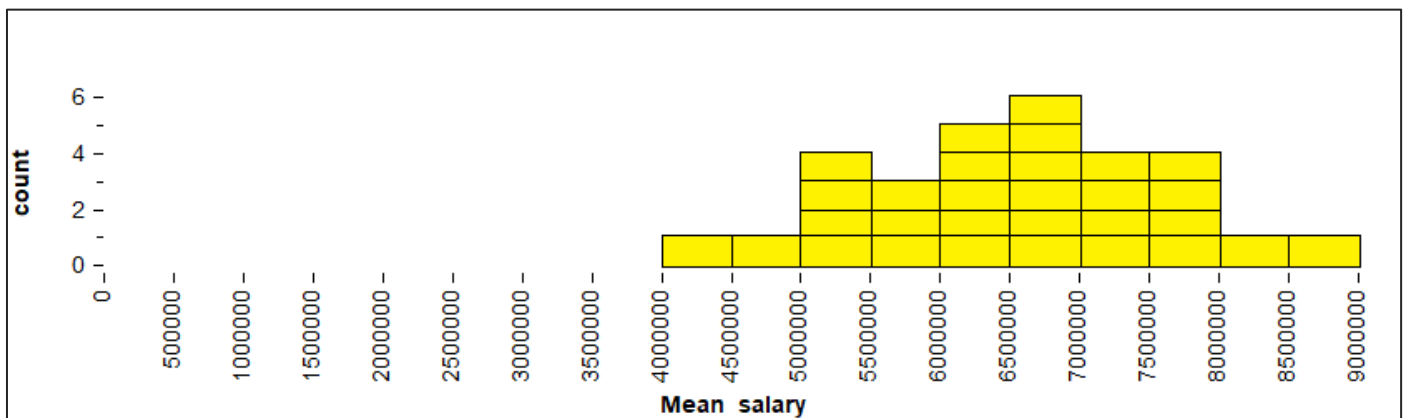
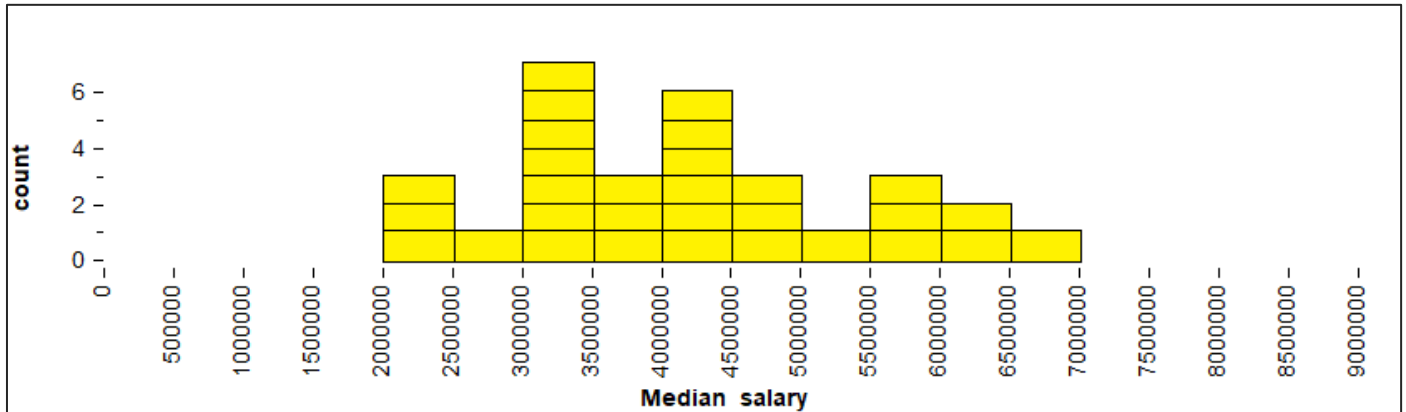
As a class, compare findings. Ask students to describe the shapes of their data displays:

- *Are all the data points clustered closely together?*
- *Are there any outlying salaries?*
- *What does the variation in your team look like?*
- *Does every team have a similar spread of salaries?*
- *How does the shape compare to the data display of your randomly sampled team?*

Have students calculate the **mean** and **median** salaries for their teams. Ask *does anyone have a team with a high mean and a high median? A low mean and a low median? A high mean and a low median? A low mean and a high median?* Students will find that **every** team has a high mean and a lower median. Discuss how this compares to the randomly generated teams. *What does this tell us about the makeup of each team?*

Comparing findings

As in the previous lesson, create two class histograms, one for mean salaries and one for median salaries. One way of doing this is to draw a plot on the whiteboard and have students record their teams' names and mean and median salaries on post-it notes and place them on the plot. The histograms will resemble those below.



Ask students what they notice about these graphs and discuss observations. Some points for discussion:

- How do these graphs compare to the ones for the randomly generated teams in Lesson 1?
- How could you describe the shapes of these graphs? What does the variation look like?
- Are there any outliers? Why/why not?
- The mean salaries are generally higher than the median salary. What does this tell us?

Reflection

As a class, discuss: *If someone asked you how much the players on your team get paid, what would you answer?*