# Temperature’s rising

Students explore the daily maximum temperature in their local area over a 30-year period. Students compare their local data with data from an intrastate area with a contrasting geographical climate.

Students will need at least one digital device per pair to interact with this lesson.

## Visible learning

### Learning intention

* To be able to compare box plots.

### Success criteria

* I can use technology to construct box plots.
* I can make inferences from comparing box plots.

### 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**
* compares and analyses datasets using summary statistics and graphical representations **MA5-DAT-C-01**

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## Activity structure

### Launch

1. With at least one digital device between pairs of students, direct students to the ‘Climate risk map of Australia’ ([bit.ly/climateriskmap](https://bit.ly/climateriskmap)).
2. Students perform the following steps:
3. Enter their suburb or area of interest into the search bar.
4. Under the **Hazards** heading select **Bushfire**.
5. Select **2050** and **2100** under the **Years** heading.
6. By selecting their defined area, a pop up will show the actual value and the settings. Students are to use these values to compare the risk of bushfires for each year bracket.
7. Use a questioning strategy such as Pose-Pause-Pounce-Bounce (PDF 557 KB) ([bit.ly/posepausepouncebounce](https://bit.ly/posepausepouncebounce)) to facilitate a class discussion, comparing the bushfire risk over time.

### Explore

1. With at least one digital device between pairs of students, direct students to ‘Climate data online’ ([bit.ly/climatedataonline](https://bit.ly/climatedataonline)).
2. Display or distribute to students the video file Temperature’s rising. This video demonstrates how to interact with the webpage and Excel spreadsheet. **Note:** the video has no sound.

Alternatively, teachers can distribute Appendix A ‘Temperature trends’ to each student. This document models how students can access, choose and visually represent their local area temperature data using an Excel spreadsheet.

1. Students will then create their own box plots. The decades students choose can start at any year and the decades do not need to be consecutive.

Excel will create vertical box plots. A discussion could be facilitated, comparing the benefits and drawbacks of vertical and horizontal box plots.

1. Pairs then complete a ‘Turn and talk’ ([bit.ly/classroomtalkmoves](https://bit.ly/classroomtalkmoves)) with another pair, to share their initial thoughts about the trend in maximum temperatures over the 30-year period they chose.

### Summarise

1. Using their 3 box plots, students are to comment on any trends or patterns they notice in the data. Prompting questions could include:

* What do you notice when you compare the median of each box plot?
* What do you notice when you compare the range of each box plot?
* What do you notice when you compare the interquartile range of each box plot?
* Are there any outliers? If so, how do you know it is an outlier?
* Are any of the datasets symmetrical, positively skewed, or negatively skewed?

1. Use a questioning strategy such as Pose-Pause-Pounce-Bounce to facilitate a class discussion. Suggested questions could include:

* Does your data and box plots suggest that the average temperature is rising?
* Does your data and box plots support the findings of the climate risk map from the Launch?
* Do your box plots help you to analyse the data as opposed to viewing the data in a table?

### Apply

1. Students are to choose a different suburb or area of interest that has been impacted by bushfires.

Bushfire prone areas of NSW include, the [North Coast](https://en.wikipedia.org/wiki/New_South_Wales_North_Coast), [Mid North Coast](https://en.wikipedia.org/wiki/Mid_North_Coast), the [Hunter Region](https://en.wikipedia.org/wiki/Hunter_Region), the [Hawkesbury](https://en.wikipedia.org/wiki/City_of_Hawkesbury) and the [Wollondilly](https://en.wikipedia.org/wiki/Wollondilly) in Sydney's far west, the [Blue Mountains](https://en.wikipedia.org/wiki/Blue_Mountains_(New_South_Wales)), [Illawarra](https://en.wikipedia.org/wiki/Illawarra) and the [South Coast](https://en.wikipedia.org/wiki/South_Coast_(New_South_Wales)), [Riverina](https://en.wikipedia.org/wiki/Riverina) and the [Snowy Mountains](https://en.wikipedia.org/wiki/Snowy_Mountains).

1. Students repeat the process from the Explore section to construct 3 box plots.
2. Students discuss the following questions with their partner:

* Which box plots include the years when bushfires occurred? Can you tell from the box plot?
* Have the box plots followed a similar trend to the suburb or area of interest you explored previously?

## Assessment and differentiation

### Suggested opportunities for differentiation

**Explore**

* Students could compare 2 box plots instead of 3 to reduce the cognitive demand.
* Each pair of students could investigate different locations to see if the trend in change of maximum temperatures is the same across all locations.

**Summarise**

* A scaffolded worksheet could be provided to students with sentence starters to assist with comparing box plots.
* Students could be challenged to consider if another style of graph would better represent the data.

**Apply**

* With at least one digital device between pairs of students, direct students to Climate Central ([climatecentral.org](http://www.climatecentral.org)). Students select **Map the influence of climate change on daily temperatures anywhere in the world**. Explain to students that the map shows the Climate Shift Index (CSI) for today’s average temperature. Students navigate to the suburb or area of interest they investigated previously and complete a list of things they notice and wonder.

### Suggested opportunities for assessment

**Explore**

* Students could upload a screenshot of their box plots to a shared online classroom for the teacher to assess and students to compare each other's box plots.

**Summarise**

* Student responses to the provided prompts could be collected as a work sample for assessment.
* Teacher could facilitate class discussions and observe students’ reasoning and justification in response to the provided prompts.

**Apply**

* Teachers could collect the box plots and analysis from this section as part of the formative assessment for this unit.

## Appendix A

### Temperature trends

#### Downloading and accessing the data

1. Navigate to the website ‘Climate Data Online’ ([bit.ly/climatedataonline](https://bit.ly/climatedataonline)).

**Note**: if the link takes you to the Bureau of Meteorology main site, type ‘climate data online’ in the search bar at the top right of the page and select the first search option ‘Climate data online – map search’ to take you to the relevant page.

1. Using the **Text search** option, select the **Data about** drop-down menu and select **Temperature**. Make sure the **Type of data** options selected are **Daily** and **Maximum temperature**.
2. Enter a location by typing in a suburb or an area of interest and select **Find**. Select a matching town and one of the nearest bureau stations.

If no **Matching towns** or **Nearest Bureau stations** show for your suburb or area of interest, you can search ‘BOM station number’ near your chosen area. That number can be manually entered into the **Station number** section.

1. Select **Get Data**. A new page will open in your browser.

Selecting the year is not necessary, as you can choose to download ‘All years of data’ in the next step.

1. Go to the top right tabs on this new browser page, where you will see the options **1 year of data**, **All years of data** and **PDF**. Select **All years of data**. This will save a zipped folder to your downloads folder.
2. Go to your downloads folder, select the zipped folder just downloaded, choose **extract all** and select **Extract**. This will extract the folder for you to access the csv file.
3. Open the csv file. By default, it should open in an Excel spreadsheet. You may see this message:

‘By default, Excel will perform the following data conversions in this file:

Remove leading zeros

Do you want to permanently keep these conversions’

1. Select **Convert** and then **save as** an Excel Workbook (xlsx) file with the name of the location.

#### Working with the spreadsheet

1. You are going to use the data in the spreadsheet to create 3 box plots comparing maximum temperatures over 3 decades.
2. Select the first value in the **Maximum temperature (Degree C)** column from the start of the first year of a decade, then scroll down and holding **SHIFT**, select the cell at the end of the last year of the decade, for example, 1970 to 1979.
3. Select **Insert** tab from the top ribbon menu.
4. Go to the **charts** group and select the small arrow in the bottom right corner of this group to see more options.
5. An **Insert Chart** box will pop up. Select tab **All charts**, a list of all available charts will be listed on the left. Select **Box and Whisker**, then select **OK**. This will place a box plot into your spreadsheet besides your data.
6. Select **Chart Title** in the box plot diagram to rename the title. Include the location and the decade, for example, ‘Murwillumbah 1970 to 1979’.
7. Repeat this process another 2 times choosing different decades to compare.

## References

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