# Are you average? Part 2

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| Year levelStrand(s)Lesson lengthCD Code | Year 8Statistics60 mins[AC9M8ST01](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-8/content-description?subject-identifier=MATMATY8&content-description-code=AC9M8ST01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick), [AC9M8ST04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/content-description?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) |
| Lesson summary | Students will plan and conduct a statistical investigation to find the average height of students at their school. In this lesson of the Are you average? lesson sequence, students learn about the ethics of collecting data, whether or not random samples represent a population, size of sample and conducting surveys.  |
| Learning intention | * We can understand and evaluate the implications of obtaining data through different sampling methods.
* We apply this knowledge in a real-world context statistical investigation.
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| Success criteria | By the end of this lesson, students can:* explain the significance of different sampling methods
* justify the chosen sampling method for their group's target population
* collect and present data in a coherent manner
* analyse and discuss the data's implications in relation to the average height of students at the school.
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| Why are we learning about this? | Understanding data sampling and its implications is crucial in making informed decisions. Investigating the height of students at their school offers a practical application, making the learning relevant and engaging.  |
| Prerequisite student knowledge and language | It is expected that students have:* a basic understanding of statistics and data sampling
* familiarity with terms: sampling, representative, random choice, population, survey, mean, categorical data.
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| **Resources** | Teacher’s slides (PowerPoint)Are you average template (Excel)Teacher’s notes and examples (Word)Measuring tapes, digital devices (tablets or computers) |

Curriculum information

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| Achievement standard | Students conduct statistical investigations and explain the implications of obtaining data through sampling. Students analyse and describe the distribution of data. They compare the variation in distributions of random samples of the same and different size from a given population with respect to shape, measures of central tendency and range.  |
| Content description(s) | Students learn to investigate techniques for data collection including census, sampling, experiment and observation, and explain the practicalities and implications of obtaining data through these techniques. ([AC9M8ST01](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-8/content-description?subject-identifier=MATMATY8&content-description-code=AC9M8ST01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))They plan and conduct statistical investigations involving samples of a population; use ethical and fair methods to make inferences about the population and report findings, acknowledging uncertainty. ([AC9M8ST04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/content-description?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)) |
| General capabilitiesCross-curriculum priority | **General capabilities**Numeracy: * Interpreting and representing data ([Level 7](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-8/general-capability-snapshot?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&general-capability-code=N&element-code=NS&sub-element-index=0&sub-element-code=NSIRD&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=2&subjects-start-index=0&view=advanced))

Digital Literacy: * Interpreting data ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/digital-literacy/slideout?code=DLIC5&element=1&sub-element=2))

Ethical understanding: * Exploring ethical issues ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/general-capability-snapshot?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&general-capability-code=EU&element-code=EURES&sub-element-index=0&sub-element-code=EURESB&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))

Critical and creative thinking: * Draw conclusions and provide reasons ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/general-capability-snapshot?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&general-capability-code=CCT&element-code=CCTANA&sub-element-index=0&sub-element-code=CCTANAB&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))
* Develop questions ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/general-capability-snapshot?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&general-capability-code=CCT&element-code=CCTINQ&sub-element-index=0&sub-element-code=CCTINQA&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))
* Identifying, processing and evaluating information ([Level 5](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/general-capability-snapshot?subject-identifier=MATMATY8&content-description-code=AC9M8ST04&general-capability-code=CCT&element-code=CCTINQ&sub-element-index=1&sub-element-code=CCTINQB&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))

**Related content**Digital technologies ([AC9DI8P02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9_year-10/content-description?subject-identifier=TECTDIY78&content-description-code=AC9TDI8P02&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=1&view=quick)) |
| Areas of challenge | Some students may:* use sampling methods that affect accuracy and demonstrate underestimating and bias
* think that statistical investigation requires data from the entire population
* believe that statistical investigations always have a clear answer
* have difficulty creating graphs and calculating summary statistics using technology.

To address the areas of challenge, the following suggestions are below. Teachers can: * emphasise the importance of choosing appropriate sampling methods, use examples to demonstrate the impact on accuracy, highlight pros and cons of different methods, and engage students in comparing outcomes with different sampling methods
* explain the difference between population and sample, highlight the impracticality of collecting data from the entire population and provide examples of investigations using samples, for example, market research versus census
* highlight the uncertainty and variability in statistical investigations, explain that conclusions are based on probabilities and can vary with samples, engage students in analysing results with consideration for uncertainty
* use group structures to leverage a wider range of skills and knowledge, source easy guidance videos, use an excel template with pre-coded stats and graphs.
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| Strategies | [Collaborative learning](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/teaching-strategies/collaborative-learning/)[Mathematics investigation](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/teaching-strategies/mathematics-investigation/)  |

Lesson structure

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| Learning hook10 mins | Note: This lesson is Part 2 and follows the lesson plan, Are you Average? (Part 1). It is possible for both lessons to standalone or to condense these lessons into one. The resources are designed to be modified to suit your classes and school. For the purposes of presenting the whole statistical investigation, it is assumed you have accessed Part 1. Use the Teacher’s slides and Teacher’s notes and examples to support your teaching as you progress through the investigation. **Lesson hook*** Use slides 1–6 to review relevant discussions from Are you Average? (Part 1).
* Review the five stages in ACARA’s statistical investigation process (Slide 6) and note that today students will collect data on the heights of students in the school. This is part of the ‘Do’ stage (Slide 7).
* Go to Slide 8 and introduce the Always, sometimes, never rules.
	+ **Always**: You should always get consent before collecting data.
	+ **Sometimes**: Random samples are representative of the whole population. While random samples mean everyone has an equal chance of being selected, they may still not represent the population, especially if the sample is small.
	+ **Never**: Our survey will find the mean height and gender in the school. Because gender is an example of categorical data you cannot find the mean, even in a single-sex school!
* Stay on this slide to review the agreed protocols for their data collection (prepared by students in previous lesson).
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| Explore45 mins | * Students collect data by following their agreed protocols from the previous lesson. They should have clear documentation as to their roles they are assuming. Students need to move efficiently and promptly to collect data.
* The teacher moves around the different rooms and groups checking in on progress.
* Students return to the classroom and data is entered into a spreadsheet. A downloadable example to use is available in the What you need section.
* Collate the data for the next class in Are you average? (Part 3).

**Iteration:** if time is of the essence, pre-prepare your own data to give to students. |
| Summary and reflection5 mins | Engage in a class discussion with students and summarise what students have achieved in ensure Are you average? (Part 3) is ready to go next lesson. This includes representing data and communicating results.  |
| Assessment | The following mid-sequence on-going assessment is suggested below. * Monitor student progress and cooperation.
* Engage with students who need support or encouragement. Consider those students who may struggle with the next lesson that includes analysis and communication as to whether further scaffolding is required.
* Assign (if you haven’t already) or collect answers from the selection of questions given to students at the end of the previous lesson: Are you Average? (Part 1).
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