Helping Your Child with Statistics & Data Analysis

Statistics · Year 7 to Year 10 · Australian Curriculum Mathematics

Statistics is the science of collecting, organising, displaying, and interpreting data. Every news report, health study, weather forecast, and election uses statistics. Your child learns to go beyond just drawing graphs — they learn to **question data**, identify **misleading graphs**, calculate **measures of centre and spread**, and make evidence-based conclusions.

Year	What your child learns	What this looks like at home
Year 7	**Collecting data and calculating averages** **mean** — the average: add all values, divide by how many: Mean of 3,5,7,9,6 = (3+5+7+9+6)÷5 = 30÷5 = 6 **median** — the middle value when data is in order: 3, 5, 6, 7, 9 → median = 6 **mode** — the most common value **range** — the spread: largest − smallest = 9 − 3 = 6 Your child collects data, organises it in tables, and draws column graphs, dot plots, and stem-and-leaf plots. They use the mean, median, mode and range to describe data.	**'What is the mean of our family members' ages?'** (Add ages, divide by number of people) **'Is the mean or median a better description of our data? Why?'** **Track weather: record the temperature each day for a week. Find the mean, median, and range.**
Year 8	**Data collection — how and why it matters (AC9M8ST01–ST04)** **census** — collecting data from EVERYONE in the population (slow and expensive, but complete: e.g. national census) **sample** — collecting data from a SELECTED GROUP to represent all (faster, cheaper — but must be chosen carefully) **random sample** — every person has an EQUAL CHANCE of being chosen (reduces bias, makes results more trustworthy) **experiment** — data collected by doing something and observing the result **observation** — data collected by watching without interfering Your child investigates how sample SIZE affects results: Small samples vary a lot — results change each time. Larger samples give more stable, reliable results.	**'If we asked just 5 friends which is the most popular sport, could we trust that result for the whole school?'** **'What is the difference between a census and a sample?'** (Census = everyone; sample = a chosen group) **'How could we get a random sample of 20 students from the school?'** (Draw names from a hat, use a random number generator)
Year 9	**Evaluating data and surveys in the media (AC9M9ST01–ST03)** **survey report** — a statistical claim or graph shared in the news, online or on social media Your child learns to check reports and graphs carefully: Is the sample large enough to trust the result? Is the graph misleading — does the y-axis start at zero? **sampling method** — HOW data was collected can change the result Different methods can give different results for the same question The way a graph or statistic is presented can support a particular point of view Your child also compares data sets using dot plots and histograms: **e.g. 'Which class had higher scores? Which was more spread out?'**	**Look at a news graph together. 'Does the y-axis start at zero? What would it look like if it did?'** **'Can you find a headline or graph online that might be exaggerating using how it's drawn?'**
Year 10	**Box plots, comparing distributions, scatterplots and two-way tables (AC9M10ST02–ST04)** **box plot (box-and-whisker plot)** — a graph showing the five-number summary: Minimum | Q1 | Median | Q3 | Maximum The box covers the middle 50% of data. Whiskers extend to the smallest and largest values. **interquartile range (IQR)** = Q3 − Q1 — measures the spread of the middle 50% of data Your child uses box plots to compare multiple data sets: **e.g. 'Which class had higher scores? Which was more spread out?'** **scatterplot** — plots two numerical variables to look for a relationship **correlation** — positive (both go up), negative (one up, one down), or none **line of best fit** — a line drawn through a scatterplot showing the trend **two-way table** — shows data for two categorical variables: e.g. year level vs favourite subject — are they related? Your child also evaluates claims in reports: identifying bias, misleading statistics, and limitations of conclusions.	'What are the five parts of a box plot?' (Minimum, Q1, median, Q3, maximum) **'In this data set: 2, 5, 7, 8, 9, 12, 15 — what is the median and the IQR?'** **(median=8; Q1=5, Q3=12, IQR=7)** 'If you plotted study time vs test scores, what pattern would you expect?' (Positive correlation) **'Is correlation the same as causation?'** **(No! Ice cream sales and drownings both rise in summer** **— ice cream doesn't cause drownings!)** 'Looking at two box plots — Class A and Class B — which class scored higher overall? Which was more consistent?'

★ Mean, Median, Mode and Range — what they tell us

Measure	What it is	Example (data: 2,3,3,5,7)	Watch out for
Mean	Add all, divide by how many	**(2+3+3+5+7)÷5 = 20÷5 = 4**	Pulled up by very large outliers
Median	Middle value (in order)	**2,3,3,5,7 → median = 3**	Best for skewed data (e.g. wages)
Mode	Most common value	**3 appears twice → mode = 3**	Data can have more than one mode
Range	Largest – smallest	**7 – 2 = 5**	Only uses 2 values — can be misleading

When to use median vs mean: *if your data has extreme values (outliers), the median is a fairer picture of the 'middle'. For example, Australia reports median household income — because a few very high earners would pull the mean up unfairly.*

Helping at Home — Statistics & Data Analysis

Worked examples and questions to ask · Year 7 to Year 10

How it works — worked examples

Year 7 — Finding mean, median and range

Weekly pocket money for 7 students: $5, $8, $8, $10, $12, $15, $50.

Mean	(5+8+8+10+12+15+50) ÷ 7 = 108 ÷ 7 ≈ $15.43
Median	Order: 5,8,8,10,12,15,50 → middle value = $10
Range	$50 − $5 = $45
Discuss	**The mean ($15.43) is pulled up by the outlier ($50). The median ($10) better represents most students.**

Year 8 — Comparing sampling methods

A school of 600 students wants to know the most popular school subject. Compare three ways of collecting this data.

Census	Survey ALL 600 students. Very accurate but slow and takes a long time.
Convenience sample	Ask the first 30 students you see. Quick — but biased! (Maths class at that time = too many maths lovers!)
Random sample	Number all students 1–600. Use a random number generator to pick 50. This is fairer and more trustworthy.
Key idea	**A bigger random sample → more reliable result. A biased method → unreliable even with large numbers.**

Year 9 — Spotting a misleading graph

A news graph shows a company's profit rising sharply from $980,000 to $1,000,000 — but the y-axis starts at $980,000, not $0.

The graph	Looks like a steep jump because the y-axis is 'zoomed in' and doesn't start at zero.
The real change	$1,000,000 − $980,000 = $20,000, which is about 2% of $980,000 — a small rise, not a dramatic one.
Redrawn fairly	If the y-axis started at $0, the same bar would look almost flat.
Key idea	Always check where a graph's axis starts before judging how big a change really is.

Questions to ask your child

You don't need to solve these. Ask them and let your child explain their thinking!

7 Year 7

→ Find the mean, median, mode and range of: 4, 7, 7, 9, 13.
→ Which average best represents this data: 2, 3, 3, 4, 50? Why?
→ Make a stem-and-leaf plot of these values: 12, 15, 23, 27, 31, 34, 34.
→ Record the family's ages. Find the mean and median. How are they different?

8 Year 8

→ What is the difference between a census and a sample? When would you use each?
→ Why do we need a random sample? What goes wrong with a biased sample?
→ If we surveyed just the people in our street about a local issue, is that a fair sample? Why not?
→ How does sample size affect results? What happens if the sample is too small?

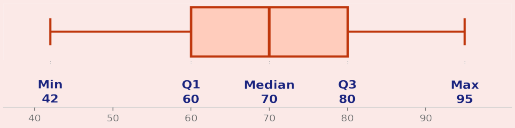
9 Year 9

→ A graph shows a big jump in sales — but the y-axis starts at 980. What is misleading about this?
→ If a survey about a school issue only asked students in one classroom, would that be a fair sample? Why not?
→ How could the way a graph is drawn make a small change look like a big one?
→ Two dot plots show goals scored by two soccer teams. How could you compare which team was more consistent?

Year 10 — Building and reading a box plot

Test scores: 42, 55, 60, 65, 68, 72, 75, 80, 88, 95. Build the five-number summary and draw a box plot.

Minimum / Maximum	Min = 42 | Max = 95 (the ends of the whiskers)
Median (Q2)	10 values → average of 5th and 6th: (68+72) ÷ 2 = 70 (middle line of box)
Q1 (lower quartile)	Lower half: 42, 55, 60, 65, 68 → Q1 = 60 (left side of box)
Q3 (upper quartile)	Upper half: 72, 75, 80, 88, 95 → Q3 = 80 (right side of box)
IQR & box plot	**IQR = Q3 − Q1 = 80 − 60 = 20.**



Year 10 — Reading a two-way table

A survey asked 60 students (30 junior — Years 7–8, and 30 senior — Years 9–10) about their favourite subject. Is subject choice related to year level?

	Maths	Art	Sport	Total
Junior	8	12	10	30
Senior	14	6	10	30
Total	22	18	20	60
Discuss		**Junior students' choices are spread fairly evenly. Senior students lean more towards Maths (14) as they start choosing elective pathways. Subject choice does look related to year level here.**		

10 Year 10

→ What are the five numbers in a five-number summary? (Min, Q1, median, Q3, max)
→ Data: 3, 5, 7, 8, 9, 12, 15, 20. Find Q1, Q2, Q3 and the IQR. (Q1=6, Q2=8.5, Q3=13.5, IQR=7.5)
→ Two box plots show Class A (median 72, IQR 10) and Class B (median 65, IQR 20). Which class scored higher? Which was more spread out?
→ What does a scatterplot show? What does a 'line of best fit' tell us?
→ What does a positive correlation look like on a scatterplot? Give a real-life example.
→ Give an example of two things that are correlated but one does NOT cause the other.
→ A two-way table shows 'sport played' vs 'grade level'. How would you find the proportion of Year 10s who play football?

Things to try at home

Year 7: Collect data: ask 10 family or friends their favourite colour (or food). Find the mode and draw a simple column graph.	**Year 7:** Record the daily temperature for 2 weeks. Find the mean, median, and range. Which week was more consistent?
Year 8: How would you get a random sample at your school? Discuss the difference between asking friends (biased) vs using a random list.	**Year 8:** Design a survey question for something you want to know about your community. Is your question fair and unbiased?
Year 9: Find a graph in the news or on social media. Does the y-axis start at zero? Could the sample used be biased?	**Year 10:** Collect two measurements from people (e.g. height and shoe size). Plot them on a scatterplot. Is there correlation? Does taller = bigger feet?

Key words to learn together

mean: the average — add all values and divide by how many there are – sometimes affected by outliers	**median:** the middle value when data is in order — not affected by outliers
mode: the most common value — data can have more than one mode	**range:** the spread: largest value minus smallest value
outlier: a value much higher or lower than the rest — can skew the mean	**quartile:** values that divide ordered data into four equal quarters (Q1, Q2, Q3)
IQR (interquartile range): Q3 – Q1 — the spread of the middle 50% of data	**box plot:** a graph showing min, Q1, median, Q3, and max in a box-and-whisker diagram
population: everyone or everything being studied	**sample:** a smaller group selected to represent the population
random sample: a sample where every member has an equal chance of being selected	**bias:** when a sample or question unfairly favours one result
scatterplot: a graph plotting two variables — each dot shows one data point	**correlation:** the relationship between two variables: positive, negative, or none
line of best fit: a straight line drawn through scatterplot data to show the trend	**causation:** one thing directly causes another — not the same as correlation

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