

A close-up photograph of several green fern fronds, showing the intricate, feathery structure of the leaves. The fronds are vibrant green and have a slightly glossy texture. They are set against a dark, blurred background, which makes the green leaves stand out. The lighting is soft, highlighting the edges and veins of the fronds.

RICH MATHEMATICAL TASK BOOKLET

STATISTICS

YEAR 7-8 ODD YEARS

Teacher Booklet

Task 1

Census at School collects data from students across New Zealand. This is some of the information they have collected about Year 8 students.

Gender:	boy
Q7 Height (cm):	166
Q8 Right foot (cm):	28
Q9 Arm span (cm):	163
Q10 Wrist circ (cm):	18
Q11 Neck circ (cm):	34
Q12 Popliteal length (cm):	45
Q13 Index finger (mm):	100
Q14 Ring finger (mm):	110
Q15 Mode of transport:	motor
Q16 Time to school (mins):	40
Q17 Weight of school bag	2
Q18 How carry school bag:	one
Q24 Cell phone (mths):	4
Q27 Fitness level:	quitefit
Q28 Pulse rate (per min):	60
Q35 Super power:	time

(from <https://new.censusatschool.org.nz/wp-content/uploads/2010/09/year8posing1.pdf>)

Liam thinks that most Year Eights who walk to school will be quite fit.

Use the data cards to investigate Liam's prediction and sort these into sets.

Make your own predictions about how students get to school, their fitness levels and what superpower they have select.

Use a table of data to show your results.

Now use a graph to record your results to present to the class.
Can you represent this in different ways?

What statements can you make about how students get to school, their fitness levels and what superpower they have select

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical)

Data can be represented and communicated in multiple ways including data visualisations. Patterns can be noticed, described, and analysed in sets of data and by using data visualisations. Predictions can be made through using sets of data. Outcomes can have different likelihoods, and these can vary.

Mathematical Language

During Year 7 and 8 Plan investigate, using multivariate datasets, summary, comparison, time-series, and relationship situations by: posing an investigative question about a local community matter making conjectures or assertions about expected findings

Teacher Notes

For this task, use a subset of the data cards from <https://new.censusatschool.org.nz/wp-content/uploads/2010/09/year8posing1.pdf>

To launch the task, give the students a set of data cards to look at. Do not explicitly highlight the variables but allow students to notice these and ask them to discuss the different datasets that they notice on the card.

Ask the students to choose one of the cards and tell a story about this. Then ask them to predict the questions that were asked.

Finally, ask students to make predictions about what they think the results would be for each piece of data and record these and put them away for a later task.

Provide students with a sub-set of the data cards and orient students to the variable that will be a focus for the lesson (category data including mode of transport, fitness level, and superpower). Firstly, ask them to use the data cards to see whether they agree or disagree with Liam and develop an argument and explanation of why they agree or disagree.

Have grid paper available for students to be able to construct graphs. Expect students to represent using two different representations. This could include using the data cards themselves to build a graph, a table of data, a picture graph using symbols, or a grid paper graph.

For the independent task, give the students a different sub-set of the data cards (group them into age sets), grid paper, stickers, or stamps. Students could also make the graphs using <https://nces.ed.gov/nceskids/createagraph/Default.aspx>

Shareback

For the first part of the task, select students to share who use the data cards and develop a clear argument as to why they agree or disagree with Liam.

For the second part of the task, select students to share who develop a graphical representation that clearly shows the data including a uniform simple symbol with spacing, alignment, and headings for the sets and numbers for the count. Ask students to share statements and justify these by referring to the dataset that they have represented.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

Connect

Ask student to re-represent their graph as a bar graph using grid paper and felts to make a column graph.

Model how to make a bar graph using
<https://nces.ed.gov/nceskids/createagraph/Default.aspx>

Suggested Learning Outcomes

Sort and analyse a dataset to answer a question.

Use data involving multivariate (variables), so that relationships between the variables can be explored.

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Justify choice of display/s with reference to the patterns to be highlighted.

Independent Tasks

Census at School collects data from students across New Zealand. This is some of the information they have collected about Year 8 students.

What questions could you ask about this data set?

Record your results in a table.

Can you represent this in different ways using a bar graph or column graph?

Make statements about what you have found out.

Anticipations

Solutions, Misconceptions

Task 2

Census at School collects data from students across New Zealand. This is some of the information they have collected about Year 8 students. Use the data cards to investigate the questions below.

How long does it take for Year 8 students to get to school?

Use a stem and leaf graph to show your results.

Make “I wonder” and “I notice” statements about the data.

What do you notice about the spread of data? What story is it telling?

Teacher Notes

Before you launch the task, introduce students to how to find the mean by asking a group of students to show what size shoes they wear using multi-link cubes. Ask students to put the sets of cubes in order from smallest to largest. Model to students how you can find the mean by adjusting the sets to make them equal (or close to equal).

To launch this task, model how to construct a stem and leaf graph with a set of data. Give students a sub-set of the data cards, select these so that students may have clusters in the data and potential outliers.

Have grid paper available for the students to use to develop their stem and leaf graph. Give students the options of using a calculator for the calculation aspects.

Facilitate the students to notice the main clusters and outliers in the data. Monitor for students using vocabulary of statistics and model this for all students.

For the independent task, have available grid paper for the stem and leaf graphs and calculators for the students to use.

Shareback

Select students to share who make statements that highlight the main clusters and outliers in the numeric data.

Record these statements onto the whiteboard and ask all students to agree and disagree with the statements with reasons. Facilitate students to notice and discuss that bar and column graphs show category data and stem-and-leaf graphs show numeric data.

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical)

Data can be represented and communicated in multiple ways including data visualisations. Patterns can be noticed, described, and analysed in sets of data and by using data visualisations.

Predictions can be made through using sets of data.

Outcomes can have different likelihoods, and these can vary.

Mathematical Language

Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.

Connect

Ask students to make statements about the shape of the data. Introduce students to concepts of mode, range, mean, and median.

Ask students to find these on their stem and leaf graphs.

Suggested Learning Outcomes

Develop an investigative question.

Develop survey questions that will help to answer an investigative question.

Display numeric data on a stem-and-leaf graph.

Make statements about data in response to an investigative question.

Communicate trends and patterns of data in meaningful ways including clusters, outliers, and shape of the data set.

Independent Tasks

Below is the amount of screen time in minutes that a group of 12-year-olds has each week.

Represent the dataset using a stem and leaf graph.

150 160 100 140 125 155 142 128 148 135 121

157 110 155 150 125 145 150 126 138 134 155

115 154 150

Use the stem and leaf graph to find the range, median, mode, and mean. What statements can you make about the amount of screen time that 12-year-olds have each week?

What other questions could you ask about this data-set?

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

Calculating the mean, median, and mode for numerical data

Calculating the range for numerical data

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

Anticipations

Solutions, Misconceptions

Task 3

Farmers is looking at stocking a new brand of school bags for children. They would like to ensure that the bags will be suitable and durable for students in Year 8.

Make “I wonder” statements related to this topic.

Use the data card sets to help you give advice to Farmers.

Represent your findings in a table of data and as graphs.

Make statements about your findings using the data and draw conclusions that will provide advice to Farmers and the characteristics of the bags that they should stock.

Teacher Notes

With the whole class before you launch the task, discuss with the students how it is important to use green space and parks in positive ways to support the well-being of the local community. Support your class to develop questions that they could investigate about the best use of green space and parks for students of their age.

Ask them to draft a series of questions that they could use to answer their key question [note this could be a literacy activity]. These questions should offer opportunities for students to collect multi-variate data and include both category and numeric sets of data (e.g., different variables such as age, gender, types of activities, sports, community gardens). Facilitate them to think carefully about this, for example if they are investigating sports then what about things like appropriate court or field sizes, or heights of basketball hoops.

Develop the questions into a survey, this could be developed onto an online survey tool (<https://www.surveymonkey.com/>), alternatively you could use a paper survey or develop data cards to be completed. Ask students from other classes in the school to complete the survey for Task 5. Ensure that the questions are appropriate and if necessary help students re-write or re-word the questions. Ask the students to make predictions about what they will find out.

For the task, facilitate the students to make “I wonder” statements. These are not questions but they can be re-shaped into questions. If needed model how to develop the statement into a question.

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical).

Data can be represented and communicated in multiple ways including data visualisations.

Mathematical Language

Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.

Teacher Notes

Have grid paper available to develop graphs. Expect students to represent using two different representations. This could include using the data cards themselves to build a graph, a table of data or grid paper graph. Students could also make the graphs using

<https://nces.ed.gov/nceskids/createagraph/Default.aspx>

For the independent task, give the students a sub-set of the data cards, grid paper, or alternatively the graphs could be created using

<https://nces.ed.gov/nceskids/createagraph/Default.aspx> or

<https://www.geogebra.org/m/BxqJ4Vag>

Shareback

Select students to share who have selected an appropriate set of data related to the overall scenario, represented this and developed statements and advice by using the data set.

Connect

Model to students how time-series data about the weight of bags for students of different ages using a line graph and ask them to use their data to do this on grid paper.

Introduce students to how to develop a line graph using

<https://nces.ed.gov/nceskids/createagraph/Default.aspx>

Suggested Learning Outcomes

Sort and analyse a dataset to answer a question.

Use data involving multivariate (variables), so that relationships between the variables can be explored.

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Justify choice of display/s with reference to the patterns to be highlighted.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

Calculating the mean, median, and mode for numerical data

Calculating the range for numerical data

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations, including those from contemporary media

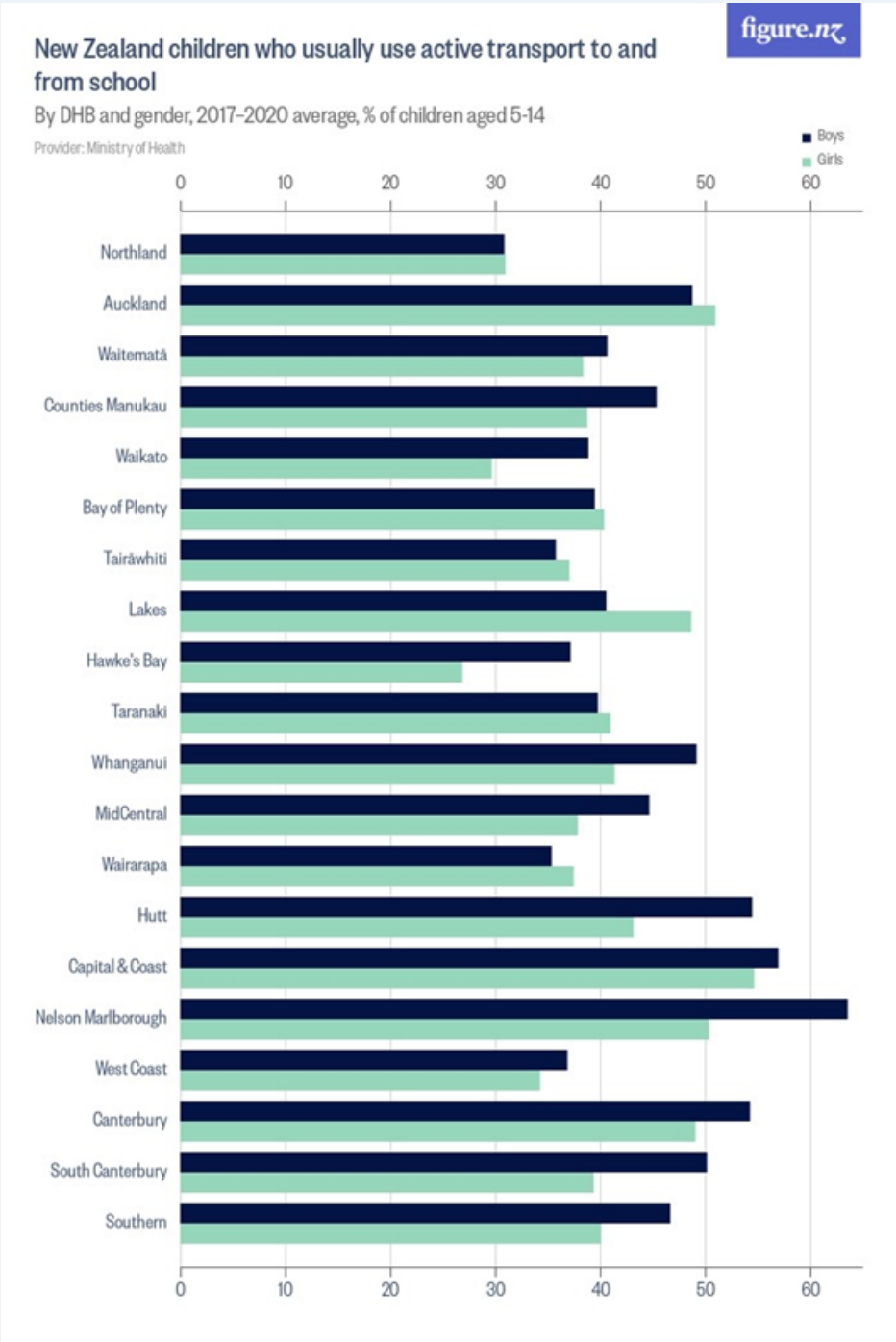
Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

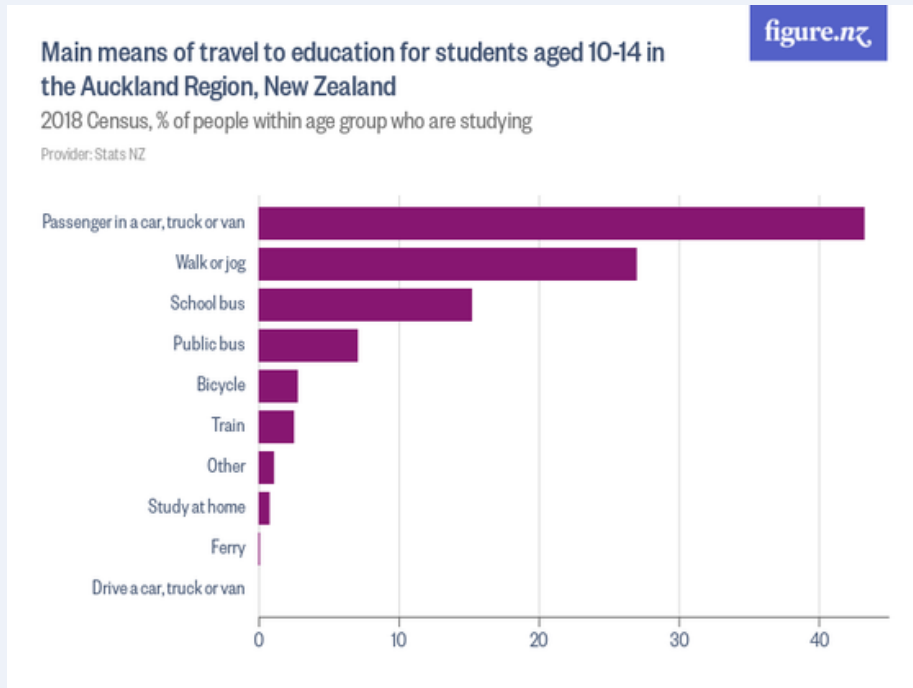
Independent Tasks

Use the set of data cards to find out information about how Year 8 students in New Zealand get to school and how long it takes. Organise the information into tables and graphs.

The graphs below provide information related to how children across New Zealand travel to school.



Independent Tasks



Reflect on the similarities and differences in your data set and graphs and these graphs.

Look at the graphs including your own and make “I wonder” statements about the data that is shown.

Then make “I notice” statements about the data. Make sure that you justify your statements by using data shown on the graphs.

Anticipations

Solutions, Misconceptions

Task 4

Census at School collects data from students across New Zealand. This is some of the information they have collected.

What do you wonder about the data? Make “I wonder...” statements.

What questions could you ask about this data set?

Choose some questions and sort the data cards to answer the question.

Now record your results as a representation.

Make “I notice” statements about the data in relation to your question.

What connections can you make between the different sets of data?

Teacher Notes

For the task, facilitate the students to make “I wonder” statements. These are not questions but they can be re-shaped into questions. If needed model how to develop the statement into a question.

Have grid paper available to develop graphs. Expect students to represent using two different representations. This could include using the data cards themselves to build a graph, a table of data or grid paper graph. Students could also make the graphs using

<https://nces.ed.gov/nceskids/createagraph/Default.aspx>

For the independent task, give the students a sub-set of the data cards, grid paper, or alternatively the graphs could be created using

<https://nces.ed.gov/nceskids/createagraph/Default.aspx>

or <https://www.geogebra.org/m/BxqJ4Vag>

Shareback

Select students to share who have selected an appropriate set of data related to their overall question, represented this and developed statements by referring to the data set.

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical)

Data can be represented and communicated in multiple ways including data visualisations. Patterns can be noticed, described, and analysed in sets of data and by using data visualisations.

Predictions can be made through using sets of data. Outcomes can have different likelihoods, and these can vary.

Mathematical Language

Statistics, data, category data, whole number data, multivariate data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, justify, outcomes, trends, average, minimum, maximum, median, mode, range, compare, bar graph, pie graph, stem and leaf graph, dot plot, column graph, mode, median, shape, cluster, outliers, time series data, line graph.

Connect

Ask to look at their initial predictions about the responses to the questions and see whether they now agree or disagree with these.

Model to students how to represent data using a dot plot and then give students a sub-set of the data related to time spent getting to school and ask them to construct a dot plot using the stickers.

Introduce students to how to develop a dot plot using
<https://www.geogebra.org/m/BxqJ4Vag>

Suggested Learning Outcomes

Sort and analyse a dataset to answer a question.

Use data involving multivariate (variables), so that relationships between the variables can be explored.

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Justify choice of display/s with reference to the patterns to be highlighted.

Independent Tasks

These data cards have different information about Year 8 students.

What questions could you ask about this data set?

Sort the data cards to answer your question.
Record your results in a table.

Represent your results using at least two different graphs.
Make statements about the data.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations

Identifying outliers by eye and taking them into account when using range as a measure of spread

Anticipations

Solutions, Misconceptions

Task 5

The local board is looking at re-developing the green space and parks in the area to best meet the needs of the local community. Using green space and parks in positive ways supports well-being. The local board would like to know the ways in which green space and parks could be used to benefit students in Year 7 and 8.

Read the questions that you wrote for your survey and re-visit the predictions that you made.

Begin by sorting the data that you have collected and developing recording systems or tables of data to organise the data.

Reflect on the type of data that you have collected and which graphs will be appropriate to represent the data. Select a graph and write a justification of why it would be appropriate to display the data.

Use the following tools to make your graphs:
<https://nces.ed.gov/nceskids/createagraph/Default.aspx> OR
<https://www.geogebra.org/m/BxqJ4Vag>

Trial using different graphs to represent the data and reflect upon which tells the story of the data most clearly.

Develop other graphs and representations that will help you answer your overall question. Record your results to present to the class.

What statements can you make about the data?

Teacher Notes

Notice students who are able to sort and record the data in a systematic manner using a table of data. Facilitate students to sort systematically if needed.

Expect students to represent using different types of graphs and selecting these based on the type of data (e.g., category vs numeric data). This could include bar graphs, dot plots, stem and leaf graphs and using comparative data displays. Students should be provided with opportunities to use online tools to develop different graphical representations.

Two options for online tools are:
<https://nces.ed.gov/nceskids/createagraph/Default.aspx> (this provides options to make bar graph, pie graph, line graph, and area graph) and
<https://www.geogebra.org/m/BxqJ4Vag> (dot plot).

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical).

Data can be represented and communicated in multiple ways including data visualisations.

Mathematical Language

Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.

Teacher Notes

Facilitate the students to notice the main clusters and outliers in the data and to make connections to their investigative question.

For the connect, support students to notice that strip graphs show number differences and can also be used to compare multi-variate groups while pie graphs illustrate the proportion across groups and dot plots show numeric data.

For the independent task, students continue to work on their statistical investigation and could construct graphs using online tools.

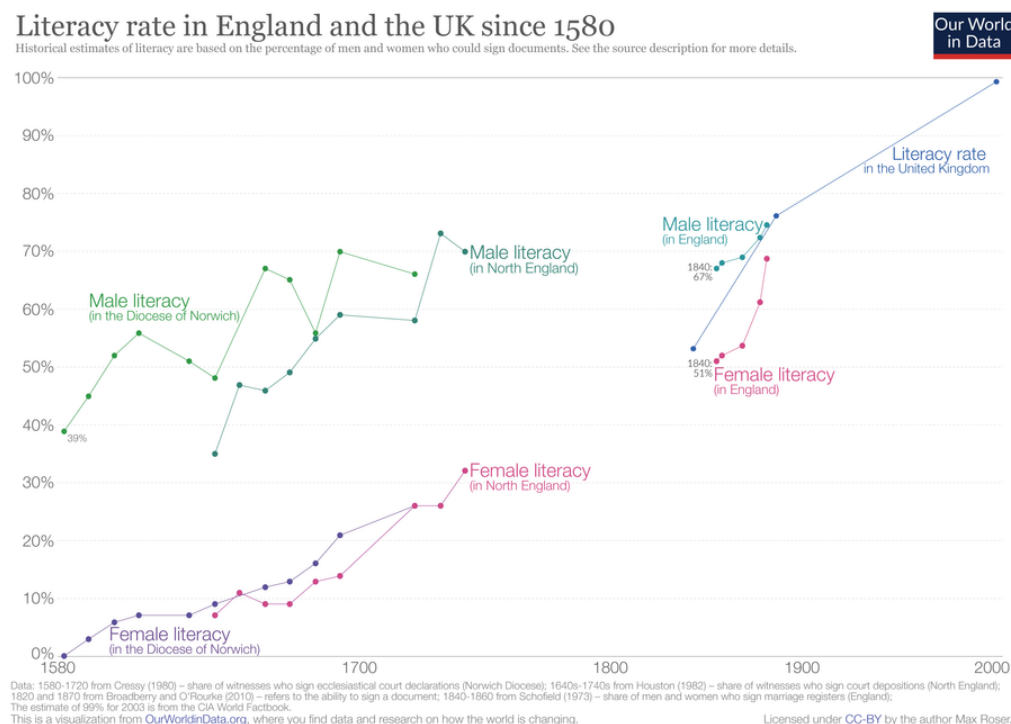
Shareback

The sharing back for this task will be in the next lesson. Bring the students back together to examine different types of graphs during the connect.

Connect

Look at this graph, what story is it telling?

What statements can you make related to the data on the graph?



Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

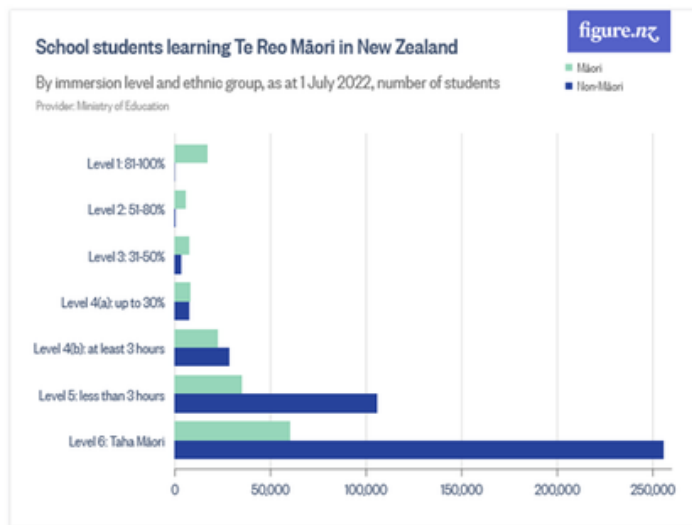
Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

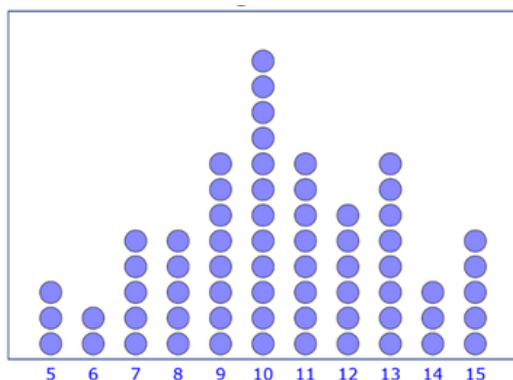
Connect

Look at this graph, what story is it telling? What statements can you make related to the data on the graph?

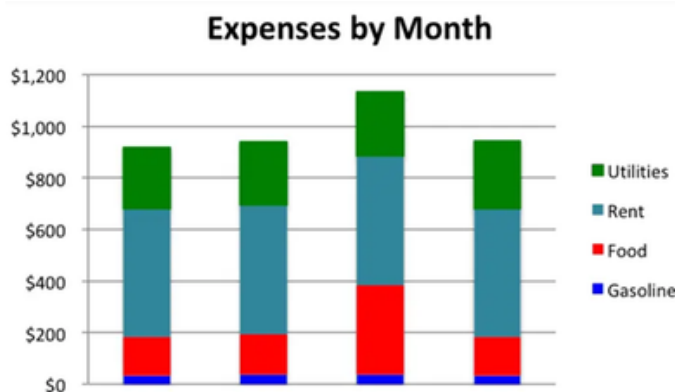


Look at this graph, what story is it telling? What statements can you make related to the data on the graph?

Time in hours spent reading over a week for Year 7 & 8 students



Look at this graph, what story is it telling? What statements can you make related to the data on the graph?



How does each graph give you information?
What type of information is each graph useful for showing?

Curriculum Links

Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)
- its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)
- its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)
- other features depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data).

Suggested Learning Outcomes

Collect, gather, and sort datasets to answer a question and tell a story.

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Justify choice of display/s with reference to the patterns to be highlighted.

Independent Tasks

The local board is looking at re-developing the green space and parks in the area to best meet the needs of the local community. Using green space and parks in positive ways supports well-being. The local board would like to know the ways in which green space and parks could be used to benefit students in Year 7 and 8.

Continue sorting the data that you have collected and developing recording systems or tables of data to organise the data.

Reflect on the type of data that you have collected and which graphs will be appropriate to represent the data. Select a graph and write a justification of why it would be appropriate to display the data.

Use the following tools to make your graphs:
<https://nces.ed.gov/nceskids/createagraph/Default.aspx> OR
<https://www.geogebra.org/m/BxqJ4Vag>

Trial using different graphs to represent the data and reflect upon which tells the story of the data most clearly.

Develop other graphs and representations that will help you answer your overall question. Record your results to present to the class.

What statements can you make about the data?

Anticipations

Solutions, Misconceptions

Task 6

The local board is looking at re-developing the green space and parks in the area to best meet the needs of the local community. Using green space and parks in positive ways supports well-being and they would like to know the ways in which green space and parks could be used to benefit students in Year 7 and 8.

Develop a presentation for the class that includes your investigation question, sampling methods, survey questions and the graphs and data displays that answer your question.

Look at the shape of your data and consider statistical aspects such as the mean, range, mode, and median and what story this tells about the data. Write statements and a conclusion about what you have found out to present to the local board.

Teacher Notes

Facilitate students to complete their presentations.

Notice students who are able to collect and sort the data in a systematic manner using a table of data. Facilitate students to sort systematically if needed.

Expect students to represent using different types of graphs and selecting these based on the type of data (e.g., category vs numeric data). This could include bar graphs, pie charts, dot plots, stem and leaf graphs and using comparative data displays.

Students should be provided with opportunities to use online tools to develop different graphical representations. Two options for online tools are: <https://nces.ed.gov/nceskids/createagraph/Default.aspx> (this provides options to make bar graph, pie graph, line graph, and area graph) and <https://www.geogebra.org/m/BxqJ4Vag> (dot plot).

Facilitate the students to notice the main clusters and outliers in the data and to make connections to their investigative question.

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

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Predictions can be made through using sets of data. Outcomes can have different likelihoods, and these can vary. .

Mathematical Language

Statistics, data, category data, whole number data, multivariate data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, justify, outcomes, trends, average, minimum, maximum, median, mode, range, compare, bar graph, pie graph, stem and leaf graph, dot plot, column graph, mode, median, shape, cluster, outliers, time series data, line graph.

Shareback

Select students to share who make statements that highlight the main clusters and outliers in the numeric data.

Record these statements onto the whiteboard and ask all students to agree and disagree with the statements with reasons.

Facilitate students to notice and discuss that bar and column graphs show category data and stem-and-leaf graphs show numeric data.

Connect

Ask students to make statements about the shape of the data. Introduce students to concepts of mode, range, mean, and median.

Ask students to find these on their stem and leaf graphs.

Suggested Learning Outcomes

Develop an investigative question.

Develop survey questions that will help to answer an investigative question.

Display numeric data on a stem-and-leaf graph.

Make statements about data in response to an investigative question.

Communicate trends and patterns of data in meaningful ways including clusters, outliers, and shape of the data set.

Independent Tasks

Look at the investigative question, data display, and conclusion that matches this.

Think critically about the conclusion and whether it aligns with the data display. Write an explanation of why you agree or disagree with the conclusion.

Write statements using “I wonder” and “I notice” from the data displays.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- *its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)*

Anticipations

Solutions, Misconceptions

Curriculum Links

- *depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data).*
- *its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)*
- *its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)*
- *other features*

Task 7

Is New Zealand a clean and green country?

Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a clean and green country.

Develop a series of “I wonder” statements about living in New Zealand and looking after the environment and nature. Use these statements to develop a question that you would like to investigate.

What predictions and statements can you make about your chosen question?

Use data sources and data displays that will help you answer your question. This could include resources from the following websites:

Figure NZ (<https://figure.nz/>)

Stats NZ (<https://www.stats.govt.nz/>)

Our World in Data (<https://ourworldindata.org/>)

Reflect on the data sources that you have found and the story that they are telling.

Develop your story and explanation of the data and what it shows. Write a series of statements that you can share with the class and a conclusion to answer your question.

Teacher Notes

Choose a topic of interest to your students and class (this could be linked to your inquiry topic). This could be whether New Zealand is a clean and green country, entertainment options, aspects of living such as employment or education or living in a fair and equal society.

During the launch, introduce the topic to the students and ask them to begin to brainstorm aspects that would be connected to the larger question. For example, in relation to whether New Zealand is a clean and green country, they could investigate levels of pollution, air quality, bio-diversity, modes of transport or environment protection.

Facilitate students to consider reputable sources for data. Introduce them to the three website resources and ask them to share any ideas that they have for other reputable resources.

Big Ideas

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical).

Data can be represented and communicated in multiple ways including data visualisations.

Patterns can be noticed, described, and analysed in sets of data and by using data visualisations.

Predictions can be made through using sets of data.

Outcomes can have different likelihoods, and these can vary.

Mathematical Language

Statistics, data, category data, whole number data, multivariate data, time-series data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, justify, outcomes, trends, average, minimum, maximum, median, mode, range, compare, bar graph, line graph, pie chart, strip graph, dot plot.

Teacher Notes

Have laptops available for students to be working on. They should also be able to either develop their presentation into a powerpoint to present or to print the graphs to make a poster presentation.

Facilitate the students to notice patterns in the data and to carefully reflect on what the graphs that they find are showing and the stories that they are telling.

Students are to continue to work on these during independent sessions.

Shareback

Ask students to share their over-arching questions and two interesting findings from their work.

Connect

Collate and discuss themes building awareness of ethical practices in data collection by strategic questioning of data-collection questions and methods

Suggested Learning Outcomes

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Tell stories and draw conclusions from data displays and reference to the patterns highlighted in these.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

Noticing and explaining outliers in a given set of data

Responding to statistical questions by calculating an appropriate measure of central tendency and range for a variety of data tables and data visualisations

Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- *its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)*
-

Independent Tasks

Is New Zealand a clean and green country?

Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a clean and green country.

Use data sources and data displays that will help you answer your question. This could include resources from the following websites:

Figure NZ (<https://figure.nz/>)

Stats NZ (<https://www.stats.govt.nz/>)

Our World in Data (<https://ourworldindata.org/>)

Reflect on the data sources that you have found and the story that they are telling.

Develop your story and explanation of the data and what it shows. Write a series of statements that you can share with the class and a conclusion to answer your question.

Curriculum Links

- *depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data).*
- *its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)*
- *its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)*
- *other features*

Anticipations

Solutions, Misconceptions

Task 8

Is New Zealand a clean and green country?

Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a clean and green country?

Use data sources and data displays that will help you answer your question. This could include resources from the following websites:

Figure NZ (<https://figure.nz/>)

Stats NZ (<https://www.stats.govt.nz/>)

Our World in Data (<https://ourworldindata.org/>)

Reflect on the data sources that you have found and the story that they are telling.

Develop your story and explanation of the data and what it shows. Write a series of statements that you can share with the class and a conclusion to answer your question.

Finish by developing your presentation into a PowerPoint or power presentation to share with the class.

Teacher Notes

Facilitate students to consider reputable sources for data. Introduce them to the three website resources and ask them to share any ideas that they have for other reputable resources.

Have laptops available for students to be working on. They should also be able to either develop their presentation into a powerpoint to present or to print the graphs to make a poster presentation.

Facilitate the students to notice patterns in the data and to carefully reflect on what the graphs that they find are showing and the stories that they are telling.

Shareback

Ask each group to share back their presentation including their question, data displays, sources, sample, statements, and conclusions

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical).

Data can be represented and communicated in multiple ways including data visualisations.

Mathematical Language

Statistics, data, category data, whole number data, multivariate data, time-series data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, justify, outcomes, trends, average, minimum, maximum, median, mode, range, compare, bar graph, line graph, pie chart, strip graph, dot plot.

Connect

Facilitate the students to agree and disagree with the statements and conclusions. Expect students to justify and reason.

Suggested Learning Outcomes

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others.

Tell stories and draw conclusions from data displays and reference to the patterns highlighted in these.

Curriculum Links

Planning and collecting data in order to respond to a statistical question (e.g. Are our feet the same length?)

For a given set of data, choosing and constructing an appropriate data visualisation according to the data type (e.g. a dot plot, bar graph, time-series graph)

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Interpreting data visualisations, including those from contemporary media

Identifying when a data visualisation cannot be interpreted accurately due to missing information

Identifying outliers by eye and taking them into account when using range as a measure of spread

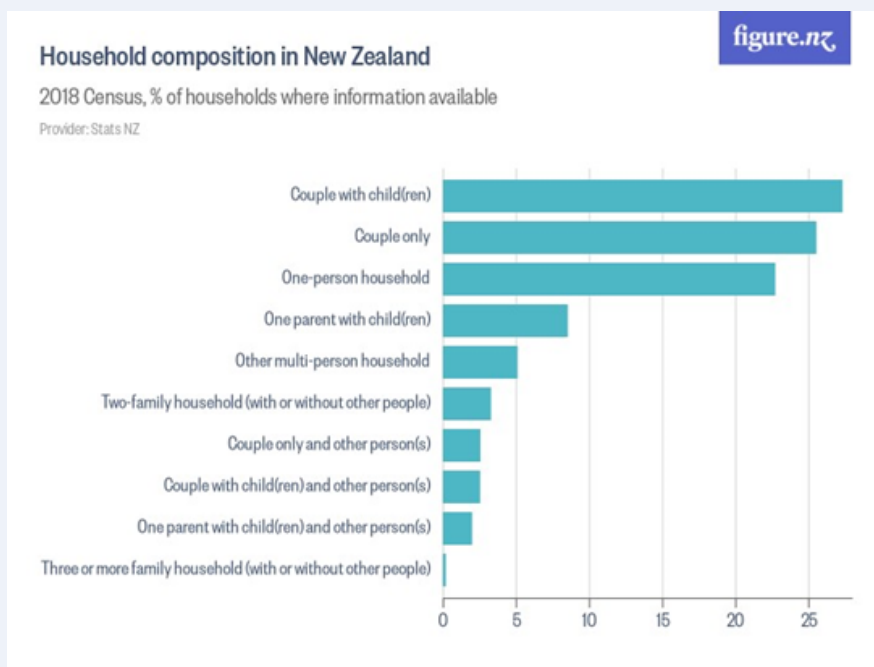
Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- *its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)*
-

Independent Tasks

Aotearoa Building company are planning a new housing development. They are thinking about the types of houses and apartments to build and the amount of different sized dwellings.

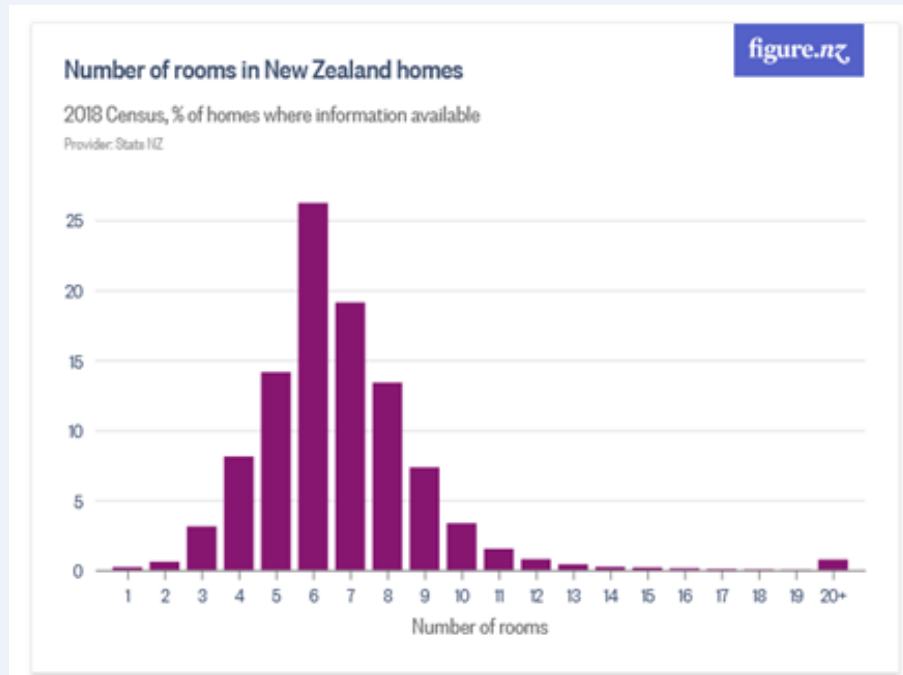
The graphs below show information about current households.



Curriculum Links

- depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data).
- its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)
- its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)
- other features

Independent Tasks



Can you use the graphs and datasets to give Aotearoa Building Company advice on the types and proportions of dwellings they should build?

What factors do you think they should take into account?

Anticipations

Solutions, Misconceptions

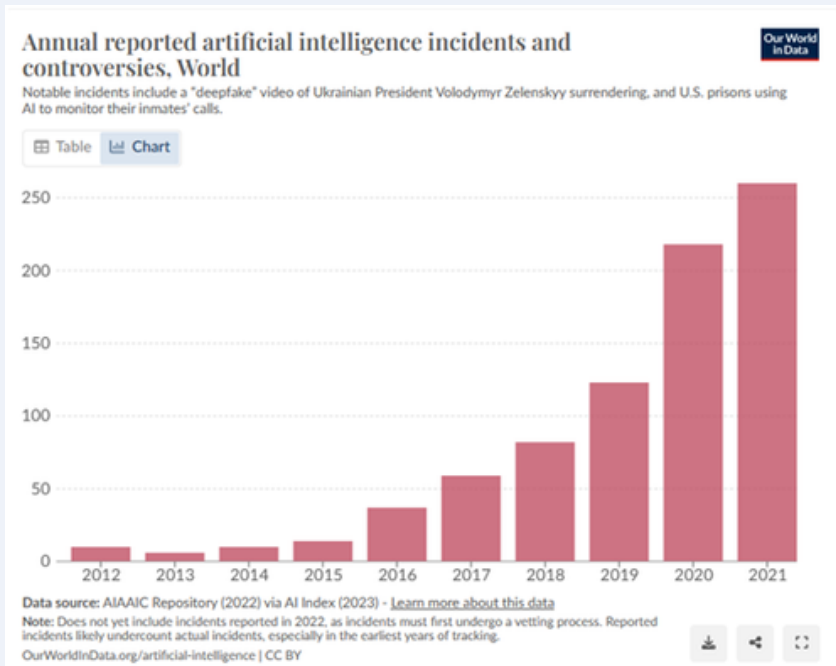
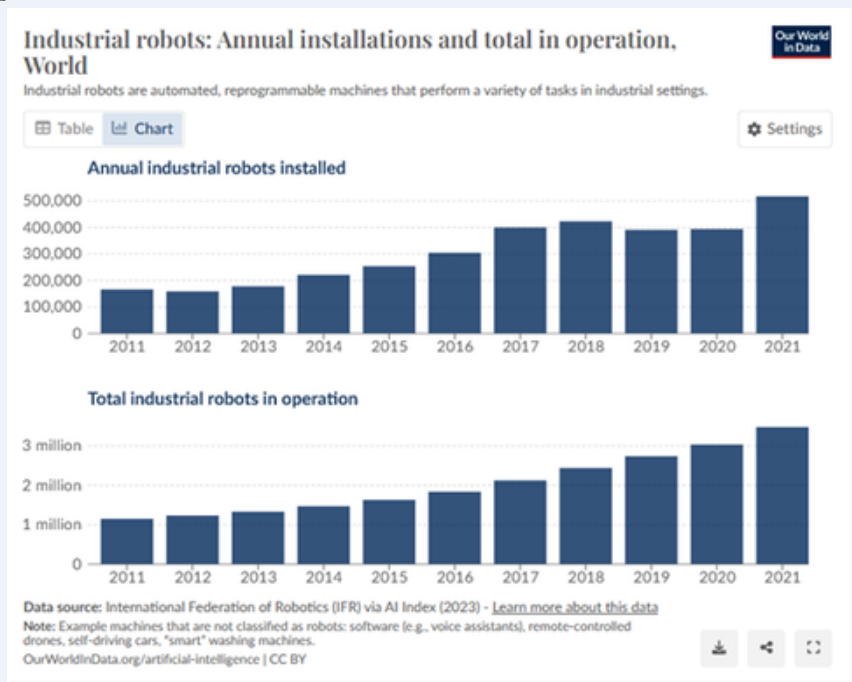
Task 9

The use of artificial intelligence (AI) has been growing and this has both been celebrated by some and a cause for concern from others. Have a look at the graphs below and think of the stories that they are telling us.

Begin by writing “I wonder” statements for each of the graphs.

Discuss what you notice in each graph and write “I notice” statements.

What stories and conclusions can you write about the data shown in the graphs?



Big Ideas

Data can be represented and communicated in multiple ways including data visualisations.

Patterns can be noticed, described, and analysed in sets of data and by using data visualisations.

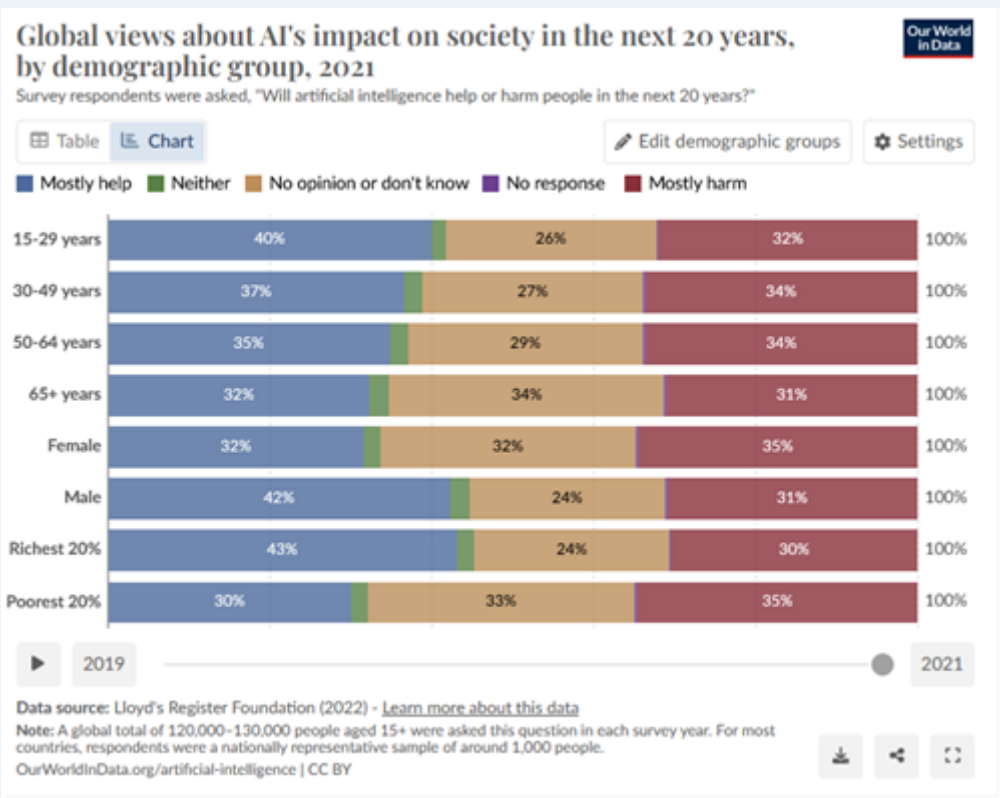
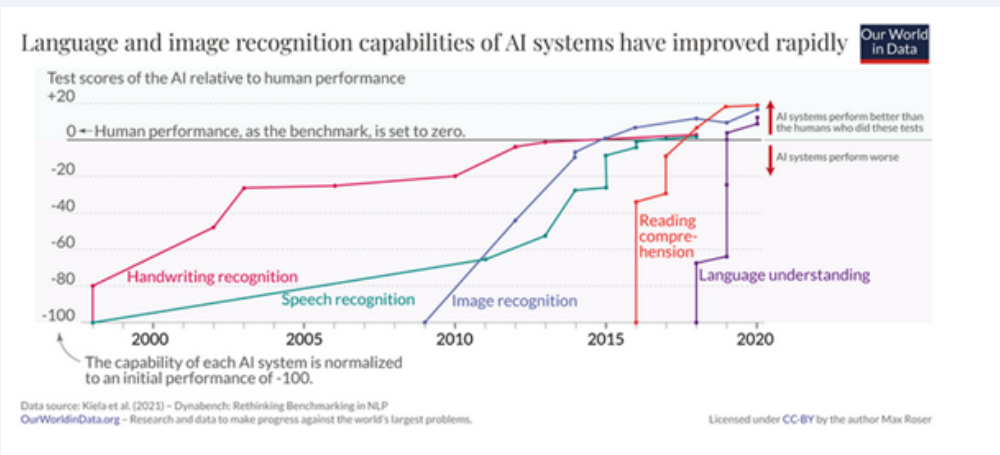
Predictions can be made through using sets of data.

Outcomes can have different likelihoods, and these can vary.

Mathematical Language

Statistics, data, category data, whole number data, multivariate data, time-series data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, justify, outcomes, trends, average, minimum, maximum, median, mode, range, compare, bar graph, line graph, pie chart, strip graph, dot plot.

Task 9



Make predictions about the use of AI in the future.

Using the data from the graphs, develop an argument as to whether AI is something which we should be concerned about or celebrating.

Curriculum Links

Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)
- its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)
- its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)
- other features depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data)

Teacher Notes

Introduce the task in parts by giving students time to discuss and make statements about each graph prior to giving them the next graph. Support them to develop the story each graph tells and to discuss the shape of the data.

Support students to read the graphs carefully noticing the differences in the scales and discussing why this might be.

Notice whether students are able to name the graph and type of data (e.g., time series data, line graph, bar graph) and to make sense of what is shown on each axis. Model the statistical language if necessary.

Shareback

Select students to share back who have developed a range of statements and conclusions from the graphs. Record the statements and the conclusions on the board or paper.

Connect

Ask students to agree or disagree with the statements that have been recorded. Facilitate students to collaboratively develop a conclusion in relation to the story told on the graphs.

Suggested Learning Outcomes

Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Consider issues such as manageability, sampling, surveying, data safety, and technology use.

Find patterns including differences and similarities between distributions, clusters and outliers within distributions, associations of variables, trend over time.

Communicate findings to others

Tell stories and draw conclusions from data displays and reference to the patterns highlighted in these.

Independent Tasks

The mean is 10. The median is 9. The data-set has 20 numbers.
What might the numbers be?

Develop a story about the data-set and the question that it might be answering.

Represent your data-set and write statements about it.

Anticipations

Solutions, Misconceptions

Task 10

This stem and leaf graph shows the heights of the players in the Silver Ferns and Vitality Roses squads. The Silver Ferns heights range from 172 cm to 193 cm and the Vitality Roses heights range from 174 cm to 191 cm.

Silver Ferns (NZ)	Stem	Vitality Roses (England)
4 4 4 2	17	4 4 5 6 6 9
8 8 7 6 6 4 3 1 1	18	0 1 3 3 3 5 6
3 2	19	1 1

What statements can you make to compare players' heights shown on this stem and leaf graph? Use mode, median, mean, range and distribution to describe some statements.

Teacher Notes

• Give students the options of using a calculator for the calculation aspects.

Facilitate the students to notice the main clusters and outliers in the data.

Monitor for students using vocabulary of statistics and model this for all students.

Shareback

Select students to share who make statements that highlight the main clusters and outliers in the numeric data. Record these statements onto the whiteboard and ask all students to agree and disagree with the statements with reasons.

Connect

Ask students to provide explanations of what the mode, median, mean, and range are helpful to show.

Big Ideas

Ideas and questions about a specific topic can be investigated through collecting data and using it to answer the questions.

Data can vary in different ways (e.g., an object can be different sizes and colours) and it can be organised in different ways and by different characteristics (categorical, numerical)

Data can be represented and communicated in multiple ways including data visualisations. Patterns can be noticed, described, and analysed in sets of data and by using data visualisations.

Predictions can be made through using sets of data.

Outcomes can have different likelihoods, and these can vary. .

Mathematical Language

Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.

Suggested Learning Outcomes

- Display numeric data on a stem-and-leaf graph.
- Make statements about data in response to an investigative question.
- Find the mean, median, range, and mode from a stem and leaf graph.
- Communicate trends and patterns of data in meaningful ways including clusters, outliers, and shape of the data set.

Independent Tasks

- Select the following assessment tasks (attached at the end of the document) as the independent activity:
- Task 1: Blah bands and boing bands.
 - Task 2: Television and homework.
 - Task 3: Healthy eating.

Curriculum Links

Interpreting a data visualisation includes describing its variables and their units, the context for the data, and the visualisation's key features:

- *its shape (e.g. the number of peaks, and whether the shape is symmetrical or skewed)*
- *its central tendency (where the middle of the data lies, as indicated visually by the centre of the visualisation and numerically by the median)*
- *its spread (how spread the data is from the minimum to the maximum value, and the numerical value of the range)*
- *other features depending on the type of data and the data visualisation (e.g. the least and most frequent categories in categorical data, trends for time-series data)*

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Statistics Year 7 /8

A company was testing rubber bands to see which were stronger. They recorded in centimetres how far the rubber band stretched before it broke. Here are the results for the tests.

	Length of stretch at breaking point (centimetres)												
Blah Bands	50	57	45	55	47	53	54	49	50	46	52	50	52
	48	53											
Boing Bands	61	36	38	40	61	61	43	38	60				
	60	42	50	37	39	41							

How can you organise and compare this data? Think about things like the mean, mode, median and range.

What statements can you make about the different types of rubber bands?

Which rubber bands do you think the company should sell? Why?

Assessment Task 2 - Statistics - Year 7 /8

This graph shows how many hours students in two classes watched television and did their homework over the week. Each dot represents a student. Think about things such as the mean, mode, median and range.

Class One



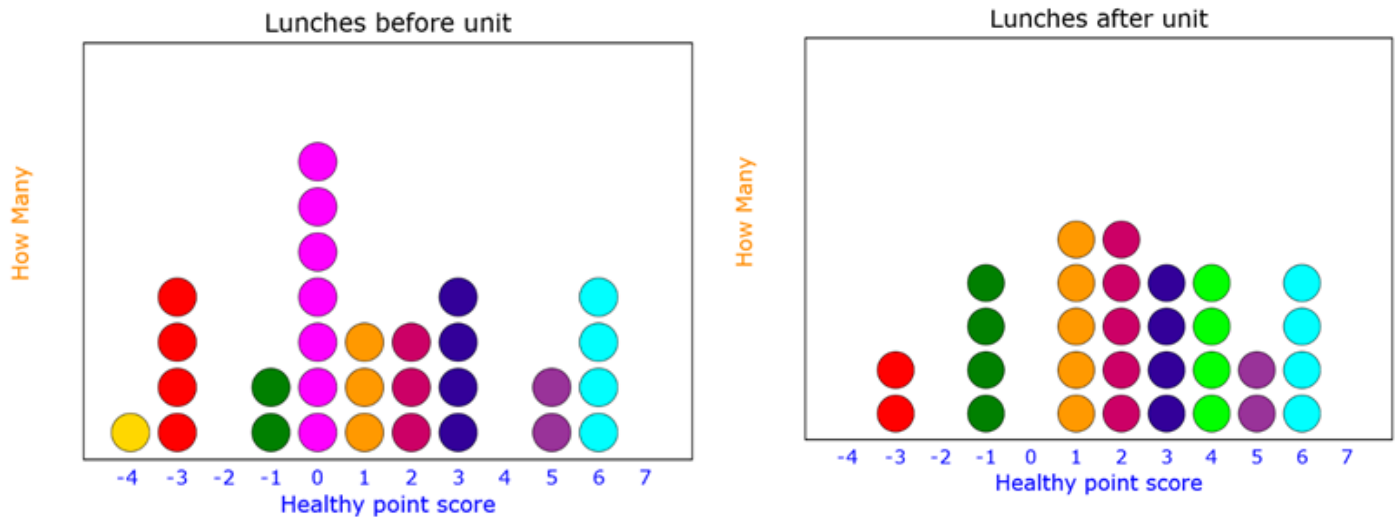
Class Two



Make statements about the data from the two classes and how much time they spend watching TV and doing homework.

Assessment Task 3 - Statistics - Year 7/8

Jane's class was doing a unit on healthy eating. Jane wanted to see if the unit would make any difference to her classmates' eating habits, so she developed a scale to measure the healthiness of the lunches they were eating. She applied the scale before and after the unit and created two dot plots to display the results.



Jane concluded that because of the unit, her classmates were now eating healthily.

Do you agree? Why or why not?