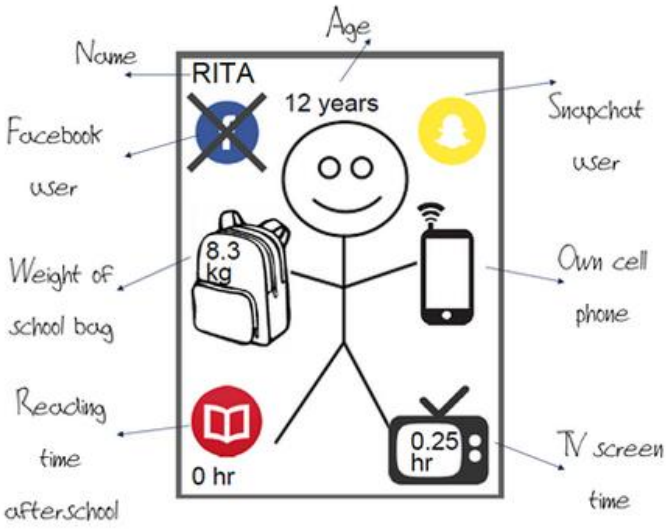
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number: Statistics

Level 4 (Year 7 - 8)

Teacher Booklet

Level 4/Year 7-8: Statistics

Task 1	Census at School collects data from students across New Zealand in relation to their leisure activities. This is some of the information they have collected.  Ayla thinks that most 12-year-olds have their own cell phone and use Snapchat and Facebook. Can you make predictions about the age of students with cell phones and using Snapchat and Facebook? Use the data cards to investigate and sort these into sets. 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 cell phone use and Snapchat and Facebook for students of different ages?
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle:

Level 4/Year 7-8: Statistics

	▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays. **NA-4-1:** Use a range of multiplicative strategies when operating on whole numbers.
Learning Outcomes: Students will be able to:	• 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.
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, compare, cluster, table of data.
Sharing back/Connect	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. **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
Teacher Notes	• For this task, use a subset of the data cards from https://new.censusatschool.org.nz/resource/stick-figure-data-cards/ • 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 their age group for each piece of data and record these and put them away for a later task. • Provide students with a sub-set (could be age bound or across ages) of the data cards and orient students to the variable that will be a focus for the lesson (category data including cell-phone, Facebook and Snapchat data). • 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
Independent Tasks	Census at School collects data from students across New Zealand in relation to their leisure activities. This is some of the information they have collected. 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	

Level 4/Year 7-8: Statistics

Level 4/Year 7-8: Statistics

Task 2	Census at School collects data from students across New Zealand in relation to their leisure activities. This is some of the information they have collected. Use the data cards to investigate the data below. How much time do children spend reading after-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?
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays. **NA-4-1:** Use a range of multiplicative strategies when operating on whole numbers.
Learning Outcomes: Students will be able to:	• 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.
Mathematical language	Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.

Level 4/Year 7-8: Statistics

Sharing back/Connect	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.
Teacher Notes	• Before you launch the task, introduce students to how to find the mean by asking a group of students to show how many people live in their house by 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.
Independent Tasks	Below are the heights of a group of 11-year-olds in centimetres. Represent the dataset using a stem and leaf graph. 148 134 145 148 121 151 146 128 134 145 129 142 137 135 165 138 142 145 130 132 136 141 140 146 148 Use the stem and leaf graph to find the range, median, mode, and mean. What statements can you make about the heights of 11-year-olds?

Level 4/Year 7-8: Statistics

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

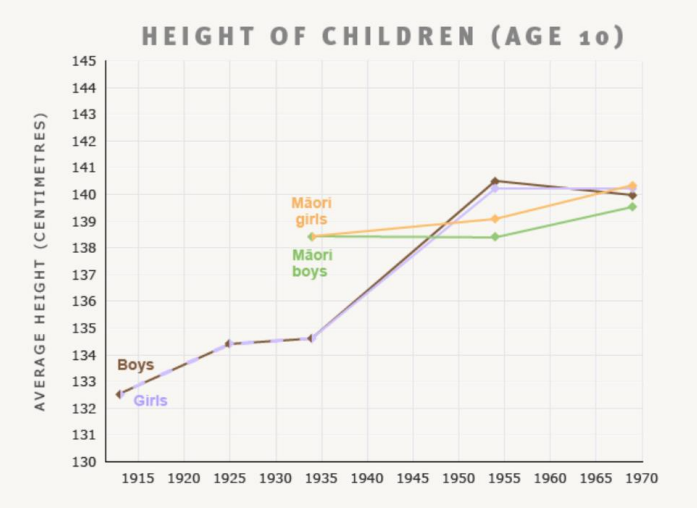
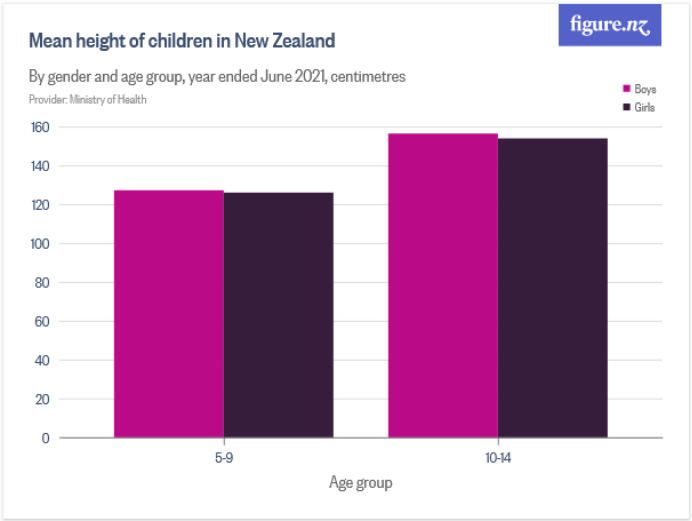
Level 4/Year 7-8: Statistics

Task 3	The Warehouse 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 across a range of ages. Make "I wonder" statements related to this topic. Use the data card sets to help you give advice to the Warehouse. 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 the Warehouse and the characteristics of the bags that they should stock.
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays. **NA-4-1:** Use a range of multiplicative strategies when operating on whole numbers. **NA-4-2:** Understand addition and subtraction of decimals.
Learning Outcomes: Students will be able to:	• 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.

Level 4/Year 7-8: Statistics

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.
Sharing back/Connect	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
Teacher Notes	• With the whole class before you launch the task, discuss with the students how keeping healthy is one way of looking after yourself and ensuring well-being. Support your class to develop questions that they could investigate about keeping healthy. 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, and time or types of activities). 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. • 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

Level 4/Year 7-8: Statistics

	• 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
Independent Tasks	The graphs below provide information related to the heights of children in New Zealand during different time periods.   Look at the graphs 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	

Level 4/Year 7-8: Statistics

Level 4/Year 7-8: Statistics

Task 4	Census at School collects data from students across New Zealand in relation to their leisure activities. 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?
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays. **NA-4-1:** Use a range of multiplicative strategies when operating on whole numbers. **NA-4-2:** Understand addition and subtraction of decimals.
Learning Outcomes: Students will be able to:	● Sort and analyse a dataset to answer a question. ● Use data involving multivariate (variables), so that relationships between the variables can be explored.

Level 4/Year 7-8: Statistics

	• 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.
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.
Sharing back/Connect	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. **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 reading 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
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

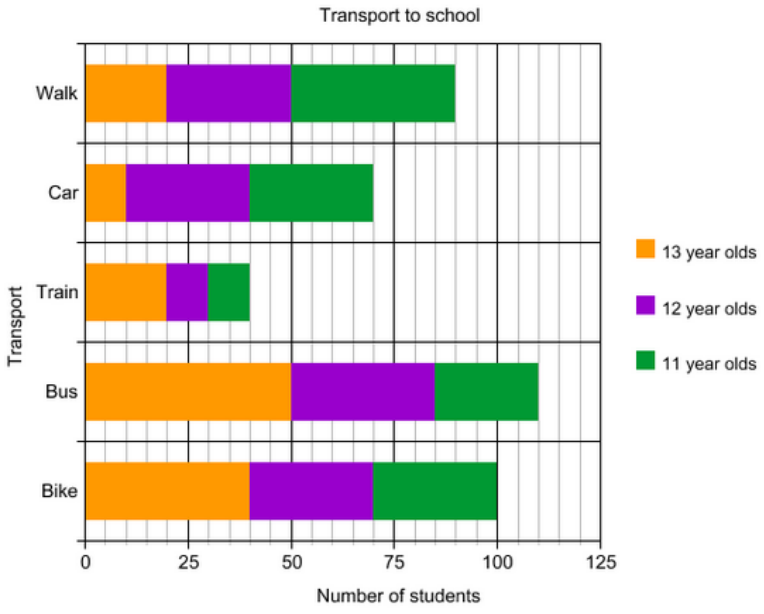
Level 4/Year 7-8: Statistics

	• or https://www.geogebra.org/m/BxqJ4Vag
Independent Tasks	These data cards have different information about the activities of students of different ages. 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.
Anticipations	

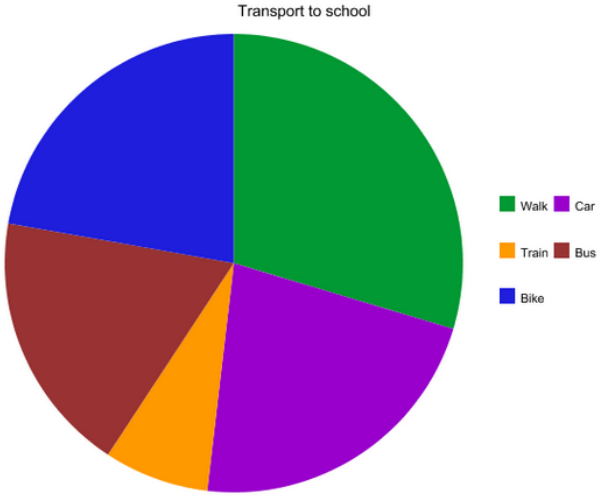
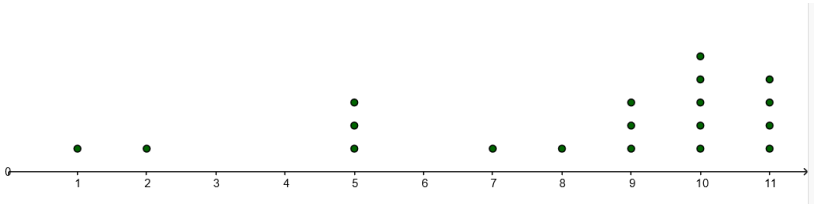
Level 4/Year 7-8: Statistics

Task 5	Making healthy choices is one way to look after your well-being. 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?
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays. **NA-4-1:** Use a range of multiplicative strategies when operating on whole numbers. **NA-4-2:** Understand addition and subtraction of decimals.

Level 4/Year 7-8: Statistics

Learning Outcomes: Students will be able to:	• 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.
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.
Sharing back/Connect	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? 

Level 4/Year 7-8: Statistics

	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? <u>Time to walk to school</u>  How does each graph give you information? What type of information is each graph useful for showing?
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, 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. • 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.
Independent Tasks	Making healthy choices is one way to look after your well-being. 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	

Level 4/Year 7-8: Statistics

Level 4/Year 7-8: Statistics

Task 6	Making healthy choices is one way to look after your well-being. 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.
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.
Curriculum links	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.
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Mathematical language	● 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.

Level 4/Year 7-8: Statistics

	• 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.
Sharing back/Connect	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.
Teacher Notes	Ask each group to share back their presentation including their question, sample, data displays, statements, and conclusions. Facilitate the students to agree and disagree with the statements and conclusions. **Connect:** Ask students to reflect on the use of different data displays and which graphs were useful to show different types of data and clusters, outliers, and overall patterns in the data.
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.
Anticipations	

Level 4/Year 7-8: Statistics

Level 4/Year 7-8: Statistics

Task 7	Is New Zealand a fair country? Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a fair country? Develop a series of "I wonder" statements about living in New Zealand. 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.
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.
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Learning Outcomes: Students will be able to:	● Ask questions about a dataset including summary, comparison and relationship questions related to the variables.

Level 4/Year 7-8: Statistics

	• 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.
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.
Sharing back/Connect	Ask students to share their over-arching questions and two interesting findings from their work.
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 fair country, entertainment options, aspects of living such as employment or education or climate change. • 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 fair country, you could investigate income levels, cost of housing or food, educational opportunities, green spaces. • 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. • Students are to continue to work on these during independent sessions.
Independent Tasks	Is New Zealand a fair country? Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a fair country?

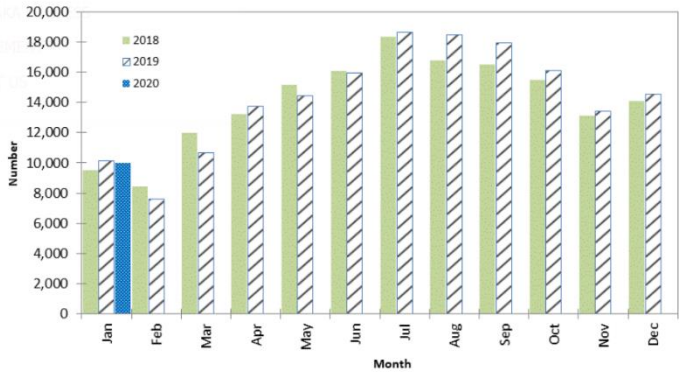
Level 4/Year 7-8: Statistics

	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.
Anticipations	

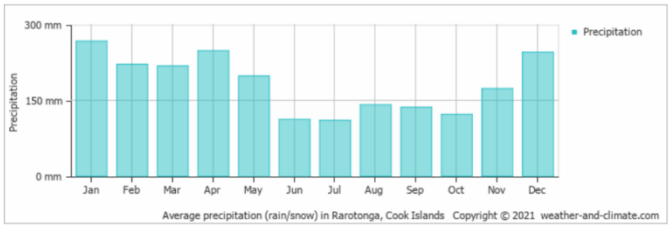
Level 4/Year 7-8: Statistics

Task 8	Is New Zealand a fair country? Think about different aspects of living in New Zealand that might help us answer whether New Zealand is a fair 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.
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. ▪ communicating findings, using appropriate displays.
Learning Outcomes: Students will be able to:	● 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.

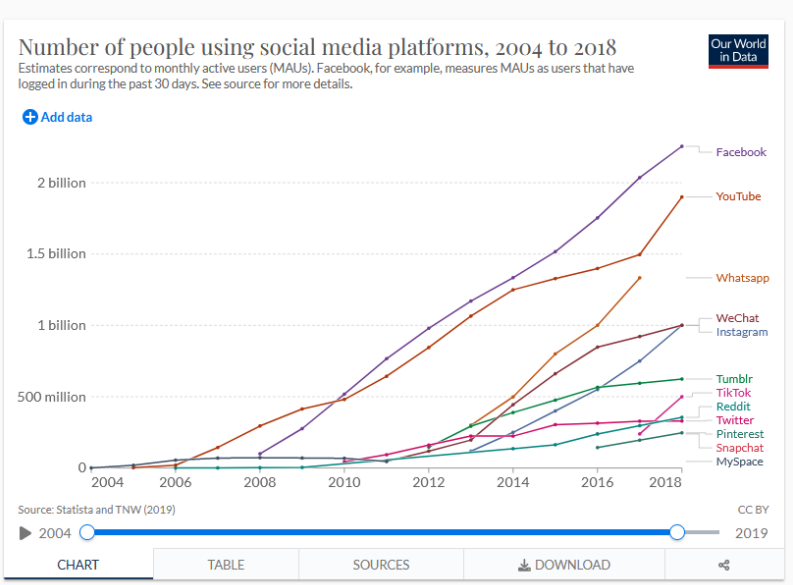
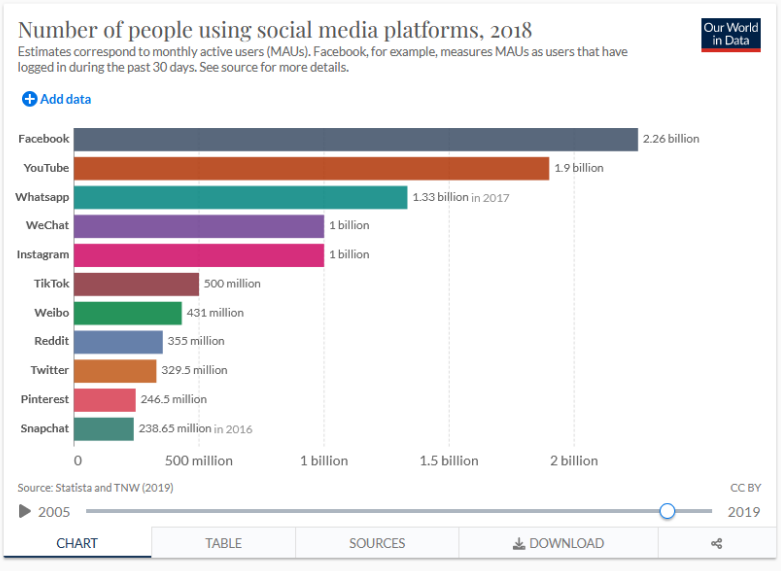
Level 4/Year 7-8: Statistics

	• 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.
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.
Sharing back/Connect	Ask each group to share back their presentation including their question, data displays, sources, sample, statements, and conclusions. Facilitate the students to agree and disagree with the statements and conclusions.
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.
Independent Tasks	Viliami and his family are considering going to the Cook Islands for a visit. He has found these graphs showing yearly visitor numbers and precipitation. Tourist visitor arrivals (2018 - 2020) 

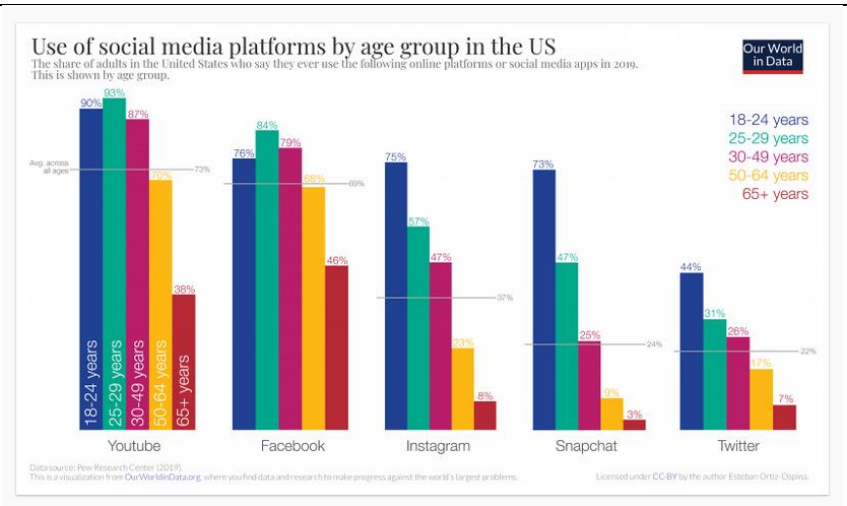
Level 4/Year 7-8: Statistics

	Monthly precipitation The mean monthly precipitation over the year, including rain, snow, hail etc.  Can you use the graphs and datasets to give Viliami advice about his decision on the best time to go to the Cook Islands? What factors do you think he should take into account?
Anticipations	

Level 4/Year 7-8: Statistics

Task 9 (optional task)	The use of social media platforms has become popular in recent years. 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?  

Level 4/Year 7-8: Statistics

	 Make predictions about the use of social media platforms in the future.
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.
Curriculum links	**S4-1:** Plan and conduct investigations using the statistical enquiry cycle: ▪ determining appropriate variables and data collection methods. ▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends. ▪ comparing distributions visually. communicating findings, using appropriate displays.
Learning Outcomes: Students will be able to:	• 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.
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.

Level 4/Year 7-8: Statistics

Sharing back/Connect	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.
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.
Independent Tasks	The mean is 20. The median is 15. The data-set has 16 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	

Level 4/Year 7-8: Statistics

Level 4/Year 7-8: Statistics

<table>
<tr><td>Task 10 (optional task)</td><td>
<table>
<tr><th>Springboks</th><th>Stem</th><th>All Blacks</th></tr>
<tr><td>7 7</td><td>16</td><td></td></tr>
<tr><td>9 8 7 6 5 4 4 3 3 2 2 0</td><td>17</td><td>1 2 6 7 7 7 9</td></tr>
<tr><td>9 9 9 9 9 7 6 6 6 5 5 4 4 4 4 4 3 3 2 1 0 0</td><td>18</td><td>2 3 3 3 4 5 6 6 7 7 8 9 9</td></tr>
<tr><td>8 8 8 6 4 3 1 1 0</td><td>19</td><td>0 0 0 0 1 2 2 2 3 4 5 5 6 7 7 7 7 8 8 9 9 9</td></tr>
<tr><td>6 5 3 0 0</td><td>20</td><td>2 4</td></tr>
</table>
This stem and leaf graph shows the heights of the players in the Springboks and All Blacks squads. The Springboks heights range from 167cm to 206 cm and the All Blacks heights range from 171 cm to 204 cm.

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.</td></tr>
<tr><td>Big ideas</td><td>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.</td></tr>
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▪ determining appropriate variables and data collection methods.
▪ gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends.
▪ comparing distributions visually.
▪ communicating findings, using appropriate displays.
NA-4-1: Use a range of multiplicative strategies when operating on whole numbers.
NA-4-2: Understand addition and subtraction of decimals.</td></tr>
<tr><td>Learning Outcomes: Students will be able to:</td><td>• 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.</td></tr>
</table>

Level 4/Year 7-8: Statistics

Mathematical language	Statistics, data, sample, investigate, organise, display, sort, classify, represent, communicate, predict, outcomes, stem-and-leaf graph, mode, median, range, cluster, outlier.
Sharing back/Connect	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.
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.
Independent Tasks	Select the following assessment tasks (attached at the end of the document) as the independent activity: S8: Blah bands and boing bands. S9: Television and homework. S10: Healthy eating.
Anticipations	

Level 4/Year 7-8: Statistics

DMIC
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

STATISTICS - INVESTIGATION: LEVEL 3 - 4 Task S8 [TEACHER NOTE: Students can use calculators to examine the data]

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?

Level 4/Year 7-8: Statistics

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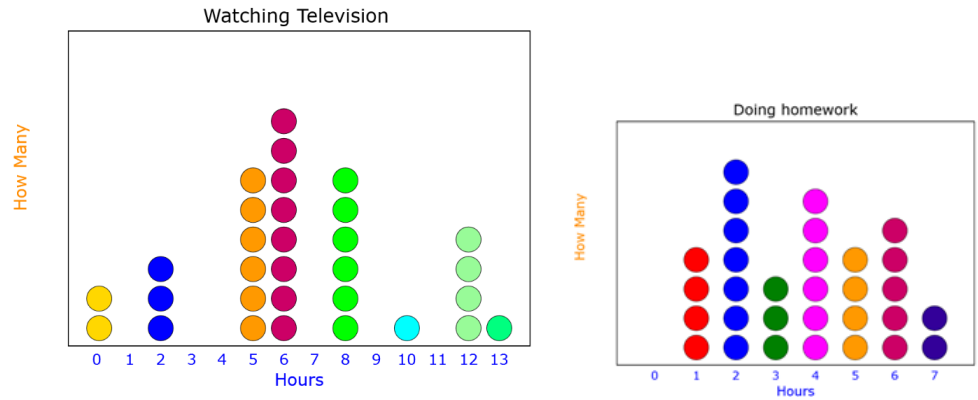
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

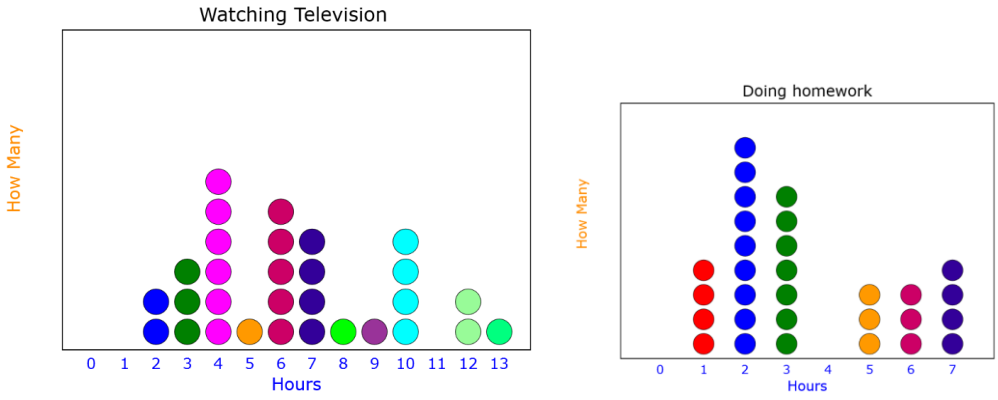
STATISTICS - LITERACY: LEVEL 4 Task S9 [TEACHER NOTE: Students can use calculators to examine the data]

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



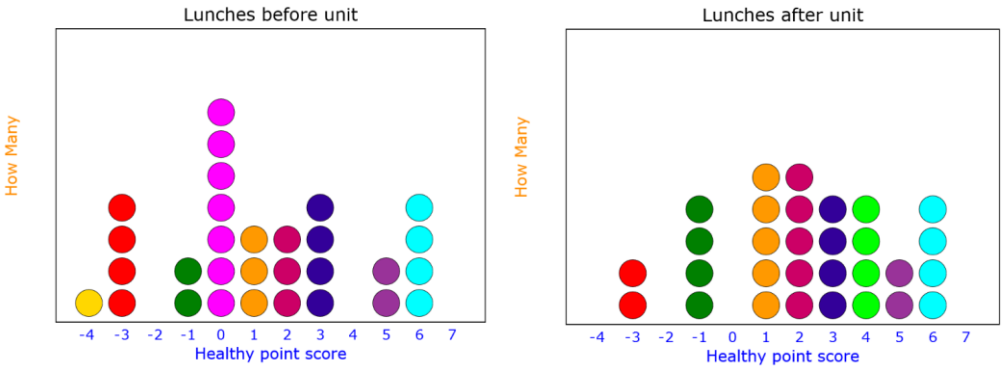
Make statements about the data from the two classes and how much time they spend watching TV and doing homework.

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

STATISTICS - LITERACY: LEVEL 4 Task S10

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?