MATHS IN MOTION

COLLECTING & DISPLAYING DATA

LEVEL

Level 7

ACTIVITY DESCRIPTION

Puffing Billy Railway relies on data to assist in decision making in daily operations. Train operations, passenger services, marketing, customer service, retail, food and beverage and volunteer services all use real data to contribute to the procedures, policies, and evaluations. The data collected is assessed and evaluated and assists in promoting our services and products to customers and makes predictions for the future. In this activity, students learn about methods of data collection and undertake their own surveys to record, analyse and display data.

THEME

Maths – Data Representation and Interpretation

MATERIALS REQUIRED

- "Samples and Populations" worksheet
- "Statistics" worksheet
- Ruler
- Pencil
- Eraser

INSTRUCTIONS

COLLECTING DATA

1. As a whole group, discuss the following questions and their implications.
   - Have you or a family member ever been surveyed?
   - What method were they using to survey, e.g. online, telemarketer, face to face?
   - What did they want?
   - What time did they call?
   - Why do you think companies collect data this way?
   - Do you think the information they collect is accurate? Why or why not?
   - If you wanted information about the most popular tourist experience in Victoria, how would you go about finding out this information?
2. Explain to students the difference between **primary** and **secondary** sources. Discuss **samples** and **populations**. (Refer to background information).
3. Students then complete the "samples and populations" worksheet.
4. Introduce the concept of Statistics – collecting and displaying data. Explain to the students the different methods of collecting and displaying data with emphasis on dot plots and stem and leaf graphs (refer to background information).
5. As a whole class activity ask the students survey questions that are relevant to them.

   Example: How long does it take you to get to school in the morning? How many hours/minutes do you exercise in an average week?

   Display the student responses on a white board. Then discuss different ways the data could be displayed to make it easier to interpret and analyse.

Using the student's data, create a dot plot and a stem and leaf plot.

6. Using their knowledge, students then complete the "Statistics" worksheet.

SUGGESTIONS FOR ASSESSMENT

Ability to contribute to group discussions and individual responses to worksheets.

BACKGROUND INFORMATION

Data can be collected from **primary** or **secondary** sources.

Data from a **primary source** is firsthand information collected from the original source by the person or the organisation needing the data. Example; a student conducting a survey or census data collected and then used by an organisation like the Bureau of Statistics.

Data from a secondary source have been collected, published, or summarised by someone else before we use it. Data collected from newspaper articles, textbooks or internet blogs represent secondary source data.

SAMPLES AND POPULATIONS

When an entire population (e.g. the whole maths class, all of the basketball teams that belong to the same club, a company or the whole country) is surveyed, it's called a **census**.

Every 5 years the Australian Bureau of Statistics survey every household in Australia. We call this the census of Populations and Housing.

When a subset of the population is surveyed, it's called a **sample**. Samples should be randomly selected and large enough to represent the views of the overall population.

When we cannot choose which members of the population to survey, and can record only those visible to us (e.g. people posting their political views on a news website), this is called an **observation**.

COLLECTING AND DISPLAYING DATA

DOT PLOTS

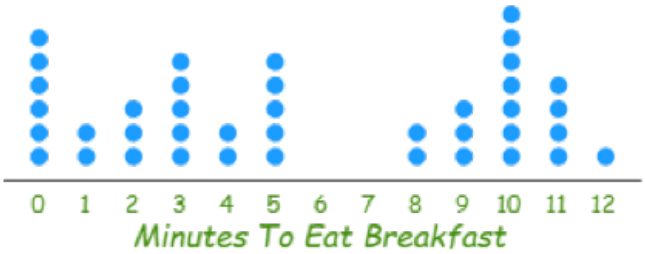
A Dot Plot is a graphical display of data using dots.

Example: Minutes to Eat Breakfast

A survey of "How long does it take you to eat breakfast?" has these results:

Minutes:	0	1	2	3	4	5	6	7	8	9	10	11	12
People:	6	2	3	5	2	5	0	0	2	3	7	4	1

The dot plot:



Reference:
https://www.mathsisfun.com/data/dot-plots.html

STEM AND LEAF PLOTS

What is a Stem and Leaf Plot?

When given a list of numbers it can sometimes be difficult to visualize and quickly understand that data. There are many ways that the data can be presented to help quickly understand parts of that data. One of these methods is by using a stem and leaf plot. What is a stem and leaf plot? A stem and leaf plot is defined as a type of table where the stem (or first column) represents the first place values of numbers and the leaves (or second column) represent the final place value of the numbers. The stem and leaf display is comparable in appearance to a horizontal bar graph, where the stem and leaf use the actual digit values instead of bars.

The stem and leaf graph is used to be able to easily see data points such as:

- **Range**: the maximum and minimum number in the data set
- **Outliers**: any numbers in the data set that is an abnormal distance from other data points
- **Median**: the central number when looking at the number chronologically
- **Mode**: the most common number
- **Shape of data distribution**: explains if most numbers are grouped around the centre, lower range, higher range, or evenly distributed across the graph

The stem in a stem and leaf plot represents the larger grouping of digits in the data. The leaf represents the last place value of importance. If data ranges from 1 to 99, as whole numbers, then the stem could represent the tens digits in each data point. And the leaf would represent the ones digits. If the data ranges from 1-99 but includes a decimal place to the tenth, then the stem could either represent the tens digits and have each number rounded to the nearest whole number and the leaf would again represent the ones digits, or the stem could represent the tens and ones digits and the leaf would represent the tenth digits.

Stem	Leaf
0	1 6
1	
2	0 5 5
3	6
4	
5	
6	
7	
8	
9	2 5 9

The important characteristic is that the leaf represents the last significant digit and only represents a single digit, and the stem represents the other digits and can represent more than one digit. Another important characteristic is that the stems need to include all chronological values for that place value, even if no data points exist within that range. For example, the above stem and leaf plot includes the place values 1, 4, 5, 6, 7, and 8 even though there are no leaves (no data points) in those sections because there are data points above and below those numbers. Leaves need to be written in from the lowest to the highest value.

Reference: https://study.com/academy/lesson/how-to-make-a-stem-and-leaf-plot.html

CURRICULUM LINKS

Mathematics

Level 7

Statistics and Probability - Data representation and interpretation

Identify and investigate issues involving numerical data collected from primary and secondary sources (VCMSP268)

Construct and compare a range of data displays including stem-and-leaf plots and dot plots (VCMSP269)

WORKSHEET – SAMPLES AND POPULATIONS

		CENSUS, SAMPLE OR OBSERVATION
1.	The heights of students in your class	
2.	The religion of Australian families	
3.	The rating of a TV show	
4.	The number of native birds found in your suburb	
5.	The number of ice creams sold in a year	
6.	The number of people that go to your local skate park in a day	
7.	The number of people living in each household in Australia	
8.	The favourite AFL team in your class	
9.	Visitors favourite part of their Puffing Billy Railway journey	
10.	The average wage of Australian families	
11.	The favourite type of music in your class	
12.	The most popular souvenir sold in the retail shop at Puffing Billy Railway	
13.	The number of cars travelling past your school between 8:30am – 9:00am each morning	
14.	The amount of recycling collected at school each day	
15.	The amount of money spent at the canteen by your class in a week	
16.	The arrival times of trains at Lakeside Station in a week	
17.	The arrival times of trains at Lakeside Station in a year	
18.	The number of people that rent their house in Australia	
19.	The number of flora species found in your backyard	
20.	The eye colour of each student in your year level	

WORKSHEET - STATISTICS

Have you ever wondered whether other people share the same thoughts and opinions as you? When used wisely, statistics can help strengthen an opinion, persuade others, or even create change. In this task you are to collect data from people in your class, about a topic, that you feel passionate about. You will then analyse and present the data as either a stem and leaf plot, dot plot or bar graph. Make sure you think about how to best display your data. Example:

- How long does it take you to get ready for school in the morning?
- How many countries have you visited?
- What is your favourite celebration during the year?
- What you favourite holiday destination?