INTERPRETATION OF DATA AT THE RAILWAY

📊 LEVEL

Year 11

Geography Unit 2 Tourism: Issues and Challenges

📖 ACTIVITY DESCRIPTION

Puffing Billy Railway is one of Victoria's major tourist attractions, drawing a national and international audience of visitors. Loved by visitors and Victorians alike, it is a highly valued tourist destination supported by the efforts of a very large, passionate, and committed group of more than 300 volunteers. Puffing Billy Railway has exceeded its visitation capacity of 480,00 visitors over the last few years (pre-covid) with over 510,000 travelling in the 2017/18 financial year.

Students explore real world visitation numbers from Puffing Billy Railway, interpret, and use this data to construct bar graphs and pie charts.
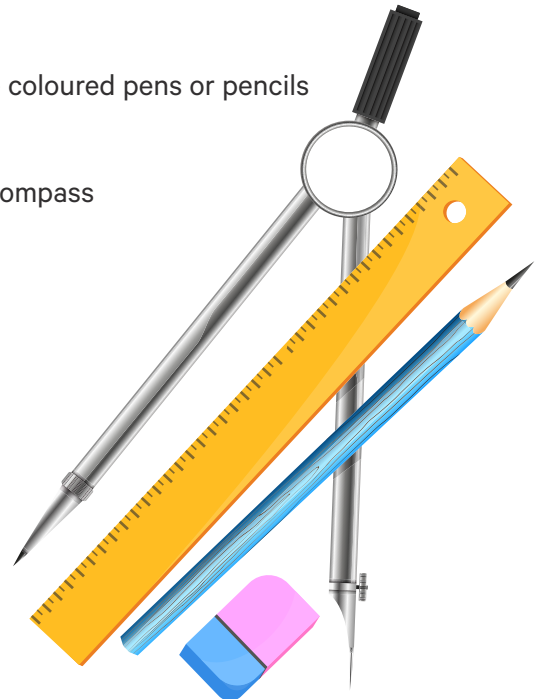
💡 THEME

Area of Study 1 – Characteristics of Tourism

Area of Study 2 – Impact or tourism: issues and challenges

🖥 MATERIALS REQUIRED

• Workbook

• Calculator

• Ruler

• Multiple coloured pens or pencils

• Eraser

• Maths compass

📋 INSTRUCTIONS

ANALYSING DATA

1. Using the background information provided, discuss the use of data sets and the importance of collecting data for an organisation such as Puffing Billy Railway. Discuss what types of data Puffing Billy Railway might collect and how the railway might use this data in the future. Examples are: Passenger numbers, trip types, staff numbers, etc.

2. As a whole group activity use the table of data below to provide a step by step example of calculating the average (mean), median and mode of a dataset.

FIVE YEAR FINANCIAL SUMMARY	2021	2020	2019	2018	2017
Days operated	121	262	362	360	364
Passengers	50,678	329,118	487,543	510,128	487,237
Revenue trips	1,231	1,231	1,837	1,849	1,910
Fare revenue per passenger	$39.35	$30.20	$29.19	$28.38	$27.68

3. Focus on "Days operated" as a whole class example. Students can fill in question 1.A, B and C on their worksheet after this class activity.

4. Ask students to look at the data set above. Focusing on 'Days operated' can they see any differences in the numbers across the years? Have a class discussion regarding the change in the days operated from 2017-2021. Why might they see these changes?

5. As a class, discuss measures of central tendency and summary statistics; mean, median and mode.

6. Ask students to calculate the mean of Puffing Billy Railway "Days operated" across the five financial years. What was the average number of days that Puffing Billy operated? Students can record the answer in their workbook.

7. Ask students to calculate the median of Puffing Billy Railway "Days operated" across the five financial years. What is the median number of days that Puffing Billy operated? Students can record the answer in their workbook.

8. Ask students to calculate the mode of Puffing Billy Railway "Days operated" across the five financial years. What is the mode of the number of days that Puffing Billy Railway operated? Students can record the answer in their workbook.

9. Discuss the use and calculation of percentages and ratios to determine data and make comparisons. Show some examples as a class.

10. There are 365 days in a year, in an ideal world Puffing Billy Railway runs train services on 364 days of the year, every day except Christmas Day. Ask the class to use this information to calculate and discuss the below.

   a. Ask students what percentage of the days in a year did Puffing Billy Railway run in 2017?

   b. Ask students what percentage of the days in a year did Puffing Billy Railway run in 2021?

   c. What is the ratio of days Puffing Billy was running in 2017 versus not running? E.g., For everyday Puffing Billy ran in 2017 it did not run ....in 2017.

   d. What is the ratio of days Puffing Billy was running in 2021 versus not running? E.g., For everyday Puffing Billy ran in 2021 it did not run ....in 2021.

11. Show students an example of a bar graph, a line graph and a pie chart.

Once students have a sound understanding of these calculations using a data set and the construction of bar graphs, line graphs and pie charts, ask each student to complete the "Transport in Numbers" worksheet.

HINT: students can use a compass to draw their pie chart.

✅ SUGGESTIONS FOR ASSESSMENT

Ability to follow step by step guided instructions and successfully interpret real-world data to answer questions. Ability to construct a bar graph and pie chart. Completion of the "Transport in numbers" worksheet.

🔍 BACKGROUND INFORMATION

DATA SET

A data set is a collection of data that is usually organized in table form. The data is placed in the table in a manner to help with understanding the information. A collection of information obtained through observations, measurements, study, or analysis is referred to as data. It could include information such as facts, numbers, figures, names, or even basic descriptions of objects.

	A	B	C	D	E
1		Bears	Dolphins	Whales	
2	2017	8	150	80	
3	2018	54	77	54	
4	2019	93	32	100	
5	2020	116	11	76	
6	2021	137	6	93	
7	2022	184	1	72	
8					

NUMBER OPERATIONS

Measures of central tendency are summary statistics that represent the centre point or typical value of a dataset. Examples of these measures include the mean, median, and mode. These statistics indicate where most values in a distribution fall and are also referred to as the central location of a distribution. When given a real-world data set determining these summary statistics can help you analyse, understand and predict trends and future trends in the data.

The three important measures of central tendency are:

CENTRAL TENDENCY — BYJU'S The Learning App. Central Tendency: Mean, Median, Mode
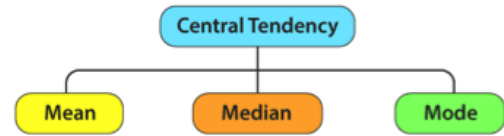
Mean- The mean represents the average value of the dataset. It can be calculated as the sum of all the values in the dataset divided by the number of values.

Median- Median is the middle value of the dataset in which the dataset is arranged in the ascending order or in descending order. When the dataset contains an even number of values, then the median value of the dataset can be found by taking the mean of the middle two values.

Mode- The mode represents the most frequently occurring value in the dataset. Sometimes the dataset may contain multiple modes and, in some cases, it does not contain any mode at all.

Another important way to interpret a data set is looking at ratios, proportions and percentages. These are concerned with dividing something into parts. Percentages and ratios summarize how one number relates to another, which helps us quickly understand the significance and relationship between the two numbers.

Percentage- Percentage is a fraction or a ratio in which the value of the whole is always 100. For example, if Sam scored 30% marks in his math test, it means that he scored 30 marks out of 100.

Ratio- A ratio compares one thing to another thing. The ratio for a recipe could compare flour to milk. For every 2 cups of flour that you will use, you will need to use 1 cup of milk.
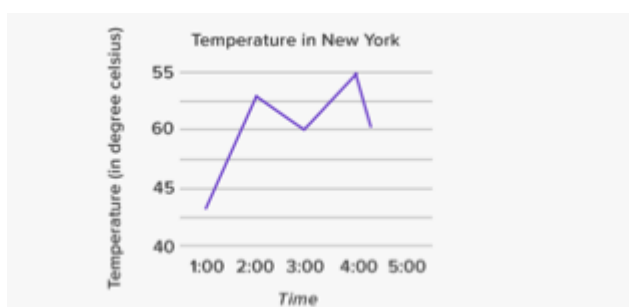
GRAPHS

Graphs communicate important quantitative information in a visual format and are often used by people to interpret the results of a study and make predictions about trends they might see in future data sets.

Bar Graph- A bar graph is a picture that is made up of bars with different height. Each bar represents a different category. The height of each bar can tell us how often something happens or show us the number of items we have for each group


Birthday of Students by Month
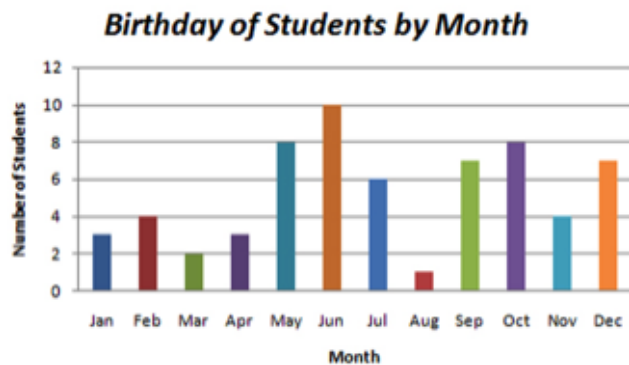
Line Graph- A line graph is a type of chart used to show information that changes over time. We plot line graphs using several points connected by straight lines.

Pie charts - A Pie Chart is a type of graph that displays data in a circular graph. The pieces of the graph are proportional to the fraction of the whole in each category. In other words, each slice of the pie is relative to the size of that category in the group as a whole. The entire "pie" represents 100 percent of a whole, while the pie "slices" represent portions of the whole.

Animals
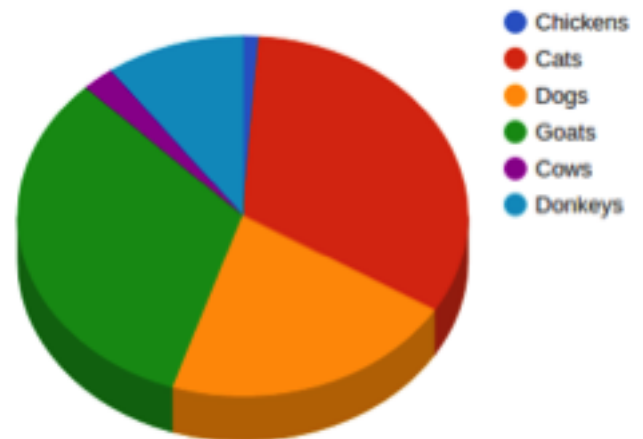
CURRICULUM LINKS

Geography Skills

Mathematics – Number Operations

• Calculate and interpret percentages, ratios, mean and median

Mathematics – Graphs

• Select, construct, and interpret line graphs, bar graphs (simple, comparative, compound and divergent) and pie charts

• Observe and describe trends in graphed time series data in accurate language

Mathematics – Tables of Data

• Interpret tables of data to determine trends and to identify significant data

WORKSHEET – TRANSPORT IN NUMBERS

FIVE YEAR FINANCIAL SUMMARY	2021	2020	2019	2018	2017
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Use the five-year Puffing Billy Railway financial summary data in the table above to answer the following questions

1. Use the data above to calculate the mean, median and mode of each category from 2017-2021 financial years:

a. Days Operated

a. Mean

b. Median

c. Mode

b. Passenger Numbers

a. Mean

b. Median

c. Mode

c. Revenue trips

a. Mean

b. Median

c. Mode

d. Fare revenue per passenger

a. Mean

b. Median

c. Mode

2. Using the data set above construct a bar graph comparing passenger numbers across the five financial years.

COMPARATIVE WORKFORCE DATA

GENDER	<19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
2020											
Male Staff	-	2	5	8	7	5	4	2	2	9	15
Female Staff	-	1	7	2	4	4	7	10	2	4	3
Male Volunteers	6	11	21	17	6	11	9	10	26	48	210
Female Volunteers	-	1	2	3	1	1	-	5	10	11	33
Undetermined Volunteers	-	1	-	-	-	-	-	-	-	-	2
Total	6	16	35	30	18	21	20	27	40	72	263
2021											
Male Staff	-	0	3	2	10	5	1	4	2	6	5
Female Staff	-	1	3	4	3	6	6	4	4	2	5
Male Volunteers	4	8	14	15	5	2	10	8	13	32	151
Female Volunteers	-	-	3	2	-	1	-	1	5	8	18
Undetermined Volunteers	-	1	-	-	-	-	-	-	-	-	2
Total	4	10	23	23	18	13	17	17	24	48	181

PUFFING BILLY RAILWAY – ANNUAL REPORT 2020-2021 19

3. Interpreting the graph above what trends do you notice?

Use the comparative workforce data in the table above to answer the following questions.

4. Puffing Billy Railway had a total of 548 staff and volunteers in 2020, and 378 staff and volunteers in 2021. Using this information and the data above calculate the following:

a. How many of these staff and volunteers identified as female

i. In 2020?

ii. In 2021?

b. What percentage of staff and volunteers identified as female

i. In 2020?

ii. In 2021?

c. What is the ratio of male to female volunteers in the Puffing Billy Railway workforce

i. In 2020?

ii. In 2021?

d. What is the ratio of volunteers to staff in the Puffing Billy Railway workforce

i. In 2020?

ii. In 2021?

5. Using the data set above construct a Pie Chart highlighting the number of undetermined, female, and male staff and volunteers working across the railway in 2020.

6. Are the answers above what you expected? Why/why not?

7. What could we include when collecting data to be more inclusive?