MATHS IN MOTION

YEAR 5 – YEAR 8

All the activities can be completed while engaging in a guided or self-guided education program at Puffing Billy Railway or when you return to school.

MEASUREMENT – TIME/SPEED

Using a stopwatch and a watch/clock/phone, record the time taken on your own journey at Puffing Billy Railway. Record your departure time at Belgrave Station and the time at each of the key locations along the track. Note: The example is just an indication of time, it is not real data.

	EXAMPLE		MY JOURNEY	
	Start Time	**Time taken between each location**	**Start Time**	**Time taken between each location**
Belgrave Station	9:00am			
Start of the Trestle Bridge	9:05am	5minutes		
Site of the Landslide	9:15am	10minutes		
Menzies Creek Station	9:30am	15minutes		
Emerald Station	9:45am	15minutes		
Nobelius Siding	9:50am	5minutes		
Lakeside Station	10:00am	10mins		
Total Time of Journey		60mins		

Once your journey is complete compare your “Total Time of Journey” with other groups? Record your findings on the next page.

Why do your answers differ to other groups?

What is the total length of your Puffing Billy Railway journey in kilometres?

Ask one of the Puffing Billy volunteers what the average speed of the train is?

Do your calculations above match the average speed of Puffing Billy? Show your workings below.

NUMBER – ALGEBRA
ALGEBRA IN MOTION

Two trains leave Lakeside Station at the same time. One train is making its return journey back to Belgrave Station, while the other train is continuing its journey to Gembrook Station.

The first train is travelling at 15km/hour and the second train is travelling at 12km/hour.

How long will it take for the trains to be 40km apart?

To solve the problem, undertake the following steps.

1. Draw a picture using all the information provided.

2. Use the following formula to solve the problem

distance = speed x time (d =s x t)

Answer: It takes_____for the Belgrave and Gembrook train to be 40km apart.

BACKGROUND INFORMATION – NA CLASS LOCOMOTIVE

WHICH PUFFING BILLY RAILWAY LOCOMOTIVE DID YOU TAKE A JOURNEY ON TODAY?

The NA Class locomotives were originally referred to as 'narrow gauge'. This was later abbreviated to NA Class. Different community locations had nicknames for the NA Class locomotive during their working lives, those known are:

- Wangaratta to Whitfield line: Polly or Old Polly
- Upper Ferntree Gully to Gembrook line: Hissin' Jinnies
- Moe to Walhalla line: Coffee Pot

Some of these names were transferred to the other lines, possibly due to the transfer of staff. All the surviving NA Class locomotives have operated on all four of the Victorian Railways narrow gauge lines during their working careers. They were transferred from line to line as they were required. Only one loco (no longer in existence) stayed on the one line. Today, only six of the original seventeen NAs remain, the others having been cut up for scrap metal.

The 8A is a popular locomotive used at the Railway that you may have taken a journey on. Built in 1908 and painted Canadian Pacific red & dark brown, this locomotive was issued to the Upper Ferntree Gully to Gembrook line. Over the years, it saw service on the Colac to Crowes and Moe to Walhalla lines, but it saw more service on the Gembrook line than any other. It was withdrawn from service in 1955 at Upper Fern Tree Gully and sold to the Beaumaris City Council where it remained on static display until 1970. After storage at Newport & Ballarat North Workshops, it was brought to Belgrave in 1976 for restoration. It was returned to service in 1982 after a complete rebuild in close to its late 1920s condition with its extended bunker & modified front end including the tapered "stovepipe" smokestack, steel cowcatcher and the all-over Black livery.

Date of manufacture: 1898-1915 **Manufacturer**: Baldwin (1-2) V.R. (3-17)

Place of manufacture: Philadelphia USA (1-2) Newport (3-17) **Locomotive Type:** Prairie

Coal capacity: 30 cwt **Cylinder diameter:** 13" **Roadworthy weight:** 35 t **Water capacity:** 780 gal

MEASUREMENT AND GEOMETRY

THE WATER TANKS

Locomotive water tanks are vital in the running of a steam train. Without the water we wouldn't have an operational steam train. At Puffing Billy Railway, we have been working on a NG/G16 project. The new front water tank and combined coal bunker are currently being manufactured. The original items were deemed to be beyond economic repair (very rusty!).

Volume is the amount of space occupied by a three-dimensional solid.

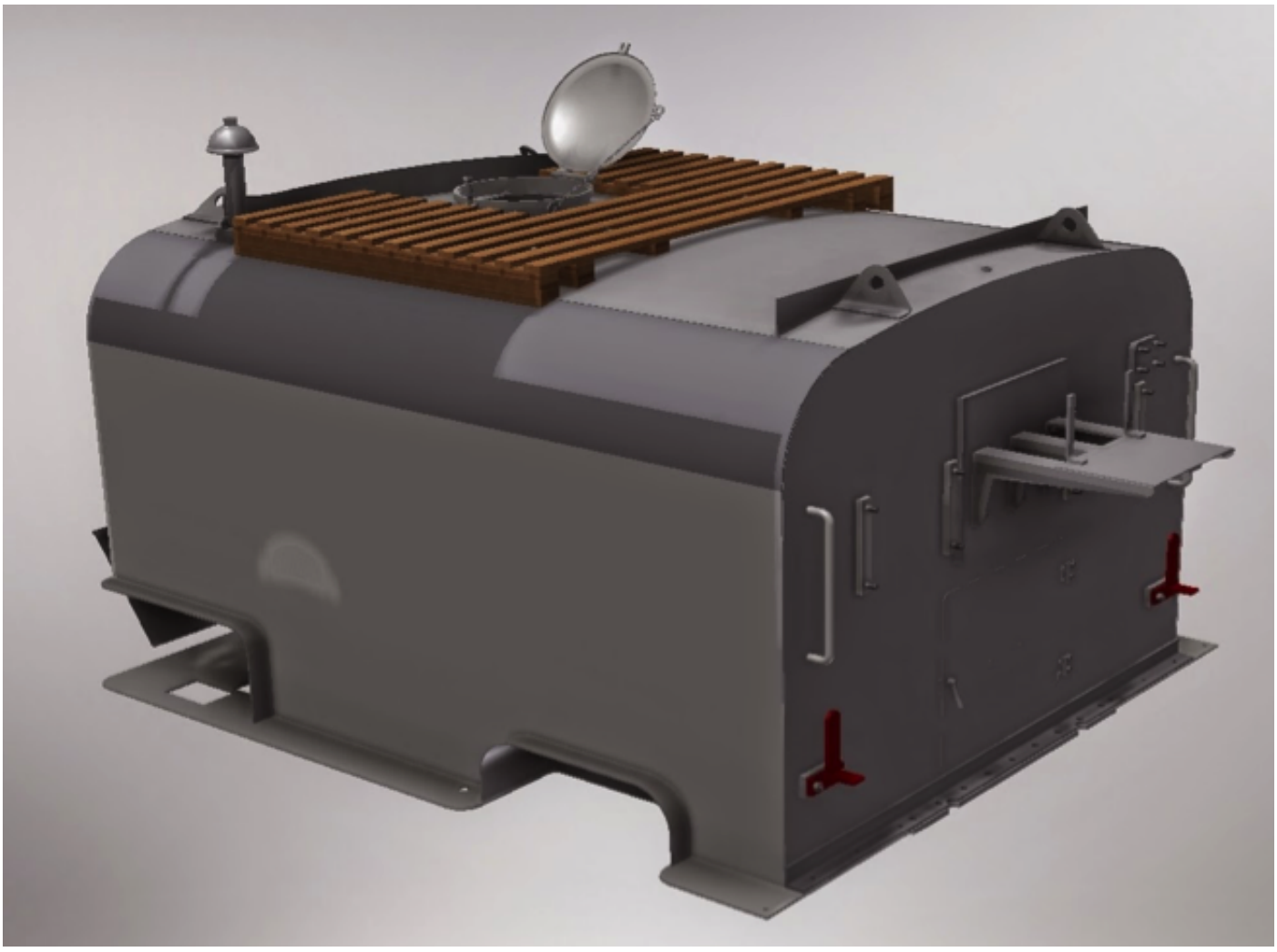
Area is the amount of space inside the boundary of a two-dimensional object such as squares and circles. When we introduce a third dimension, known as depth/length, we have three-dimensional objects such as cubes and triangular prisms.

Once you identify the cross-section and length find the volume by:

Volume of a prism = Area of cross-section **x Length**

(V = AL)

Your task is to use the drawing below to estimate the volume of the prism (water tank). Use you ruler and pencil to measure the tank. Think about the curve at the top of the tank and gaps at the bottom where it is attached to the locomotive. There are two identical gaps on the other side of the tank that you can't see.



Show your Water Tank workings here:

Answer: I estimate the volume of the water tank to be_____cm3

Extension: Select an object at Puffing Billy Railway and estimate the volume.

STATISTICS AND PROBABILITY

THE SURVEY

Conduct a survey of a population relevant to Puffing Billy Railway. Record your results in this space below. This could include everyone in your class, including you teachers. It could be all the people in your railway carriage.

Example survey questions:

What is your favourite part of visiting Puffing Billy Railway?

Responses could be:

- Hanging my legs out of the carriage
- The journey on the steam train
- Having a wonderful time with my friends
- Eating at the Café
- Walking around Emerald Lake
- Watching the train create steam and smoke from the platform

Collect your data in tables, tallies or other ways that work for you.

Describe at least two limitations of obtaining data through surveying a population. Did you experience any of these when you conducted your survey? Does the population have any bias? Explain why/why not?

THE REFLECTION

1. What areas of the Maths in Motion program were the easiest? Give the reasons why.

2. Describe any changes in your thinking as you continued with the tasks. (Did you need to make any changes to your initial ideas/plans? Why/why not?)

3. What areas of the program were the most challenging? Give reasons why.

4. What changes would you suggest to this program, if it was to be done again by other students in the future?