



**THE WORKSHOPS
RAIL MUSEUM**
IPSWICH

EDUCATION

SIMPLE MACHINES SCAVENGER HUNT

Year 4 Science Trail



This program has been produced and published by The Workshops Rail Museum, North Street, North Ipswich, Qld, Australia 4305.

The Museum's Vision Statement is:

to be recognised as a creative, innovative and exciting journey of discovery into Australia's rail story.

The Mission Statement is:

to harness the significance of the Workshops precinct by delivering international standard cultural and tourism related activities, education and public programs associated with the interaction of rail on people's lives.

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Purpose and overview

This worksheet provides an opportunity for Year 4 students to follow a trail that visits most parts of the Museum. This trail is based on simple machines where students are required to search for different types of simple machines within the buildings, locomotives, carriages and wagons, and complete activities relating to these objects.

The activities also prompt students to read the interpretive panels as they provide opportunities for discussion about nearby displays. The suggested starting point for small groups is the black steam locomotive called Pompey near the Museum entrance. Larger groups can stagger their starts according to the zone labels on the following pages.

The activities are based on different zones around The Workshops Rail Museum and are aimed at helping students develop an understanding of simple machines and how they work together to make very complex compound machines such as rolling stock and other rail related items. The activities are aligned with the Australian Curriculum: Science for Year 4 students. The Science content strands addressed are *Science Understanding*, *Science as Human Endeavour* and *Science Inquiry Skills*.

Learning Outcomes:

Students will be able to:

- Identify various simple machines that make up the compound machines used in the railways
- Identify the forces exerted on one object by another either directly or indirectly in the form of simple machines
- Understand the role of simple machines in real life, railway contexts
- Communicate their ideas and share their findings with others

Curriculum Links

The Year 4 curriculum links are elaborated in the following table:

The Australian Curriculum: Science

Science Understanding	
<p><i>Physical science</i> Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076)</p>	<p>Elaboration:</p> <ul style="list-style-type: none"> exploring how non-contact forces are similar to contact forces in terms of objects pushing or pulling another object
Science as Human Endeavour	
<p><i>Use and influence of science</i> Science knowledge helps people to understand the effect of their actions (ACSHE062)</p>	<p>Elaboration:</p> <ul style="list-style-type: none"> investigating how a range of people, such as builders or engineers use science to select appropriate materials for their work
Science Inquiry Skills	
<p><i>Questioning and predicting</i> With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (AC SIS064)</p>	<p>Elaboration:</p> <ul style="list-style-type: none"> considering familiar situations in order to think about possible areas for investigation reflecting on familiar situations to make predictions with teacher guidance
General Capabilities	
<ul style="list-style-type: none"> Literacy: Comprehending texts through listening, reading and viewing; Word Knowledge - understanding learning area vocabulary Numeracy: Estimating and measuring Critical and creative thinking: Inquiring – identifying, exploring and organising information and ideas 	

On the following page is a map of The Workshops Rail Museum. You can refer to this map to help orientate yourself throughout the trail activities.

INTRODUCTION

There are many different types of machines used in the railways, such as locomotives, carriages and cranes, as well as the tools used to build them and train lines. Most of these machines and tools are compound machines because they are made up of many smaller parts called simple machines. As you go through The Workshops Rail Museum, your task is to find as many simple machines as possible in the compound ones. Some simple machines will be easy to see, while others are more difficult.

Before you start to explore the Museum, let's revise what you already know about machines.

KEY CONCEPTS/DEFINITIONS

Work – the result of a force being applied to an object over a distance. If the object moves, then work has been done. The direction of the force and the movement must be the same.

Load – the object that needs to be moved.

Force – any influence that can change the speed, direction or movement of an object.

Effort – the amount of force used to do the work.

Mechanical advantage – the difference between the force you apply and the work you achieve. This is using a simple machine to do more work with less effort.

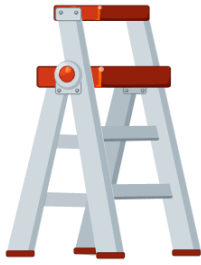



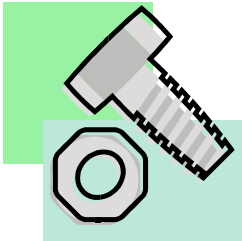

QUICK QUIZ

See what you already know about machines by answering the following questions:

Question 1: Circle the correct answer in the following questions:

1. A machine is a device that can make work easier by:
 - (a) Changing the size of the force
 - (b) Changing the direction of the force
 - (c) Increasing the speed or distance that an object is moved
 - (d) All of the above
2. How many simple machines are there?
 - (a) Twelve
 - (b) Seven
 - (c) Six
 - (d) Ten
3. What is the name of a machine that is made up of two or more simple machines?
 - (a) A complex machine
 - (b) A compound machine
 - (c) A complicated machine
 - (d) A combination machine

Question 2: Match the objects in the pictures with the type of simple machine they are:

	<p>Lever</p>
	<p>Pulley</p>
	<p>Wheel and axle (including gears)</p>
	<p>Inclined Plane</p>
	<p>Wedge</p>
	<p>Screw</p>

MUSEUM ACTIVITIES

As you visit the different zones in The Workshops Rail Museum, your task is to find as many simple machines that you can by answering the questions in this worksheet. Some of the photographs in this worksheet are whole Museum objects and are easy to find. Others, however, are parts of bigger objects and so you will need to look very carefully to see if you can find them.

For some of the activities, you will need to write the answers on your worksheet.



When you see activities with this symbol, you are to discuss your answers and ideas with other students.

ZONES 1&2: TIMEKEEPERS AND GROUNDS

This is Pompey. It was a shunting engine so it used to push and pull wagons and carriages around the Workshops.



1. Go inside Pompey's cabin. What simple machines can you see?

2. Walk around Pompey. What other simple machines can you see?



3. Discuss these questions with your group:

- a. How did Pompey move carriages and wagons around the Workshops?
- b. What is the mechanical advantage of using Pompey to move carriages and wagons?

ZONE 3: MOVING GOODS

To complete the activities for this zone, you will need to look very closely at this train to find the different machines.



1. Find this crane and label the simple machines you can see.



2. What was this crane used for?

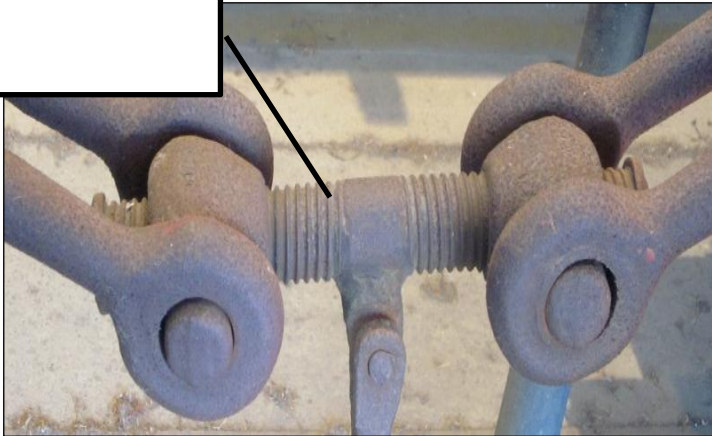
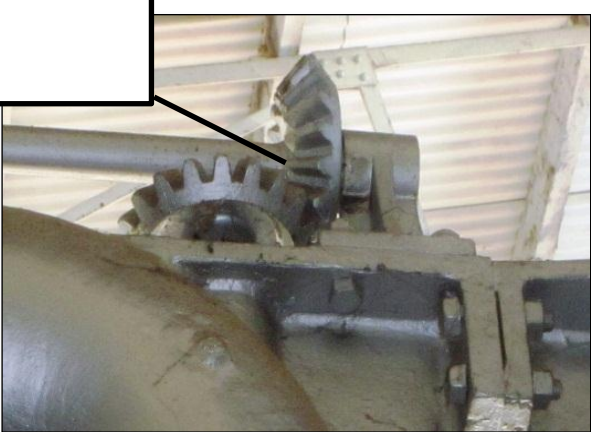
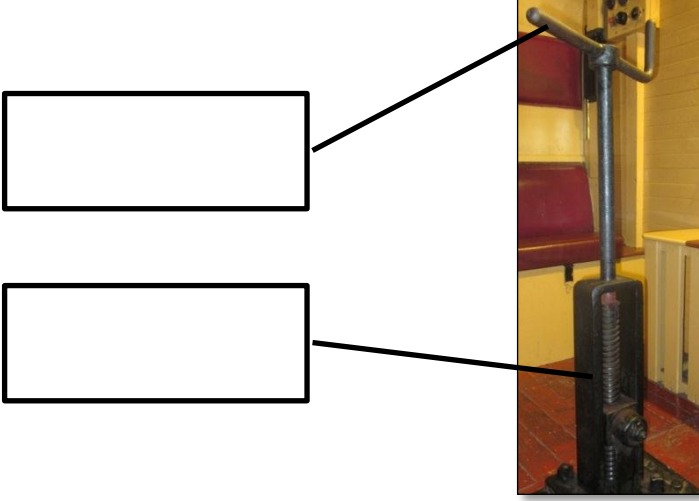


3. Discuss these questions with your group:

- What mechanical advantage is there in using this crane?
- Without the crane, how could people load the goods onto the wagons?

4. Find the objects in the photos.

- Write the type of simple machine it is in the box
- In which compound machine (Museum object) did you find it?
- Then name the object if you can – the first one has been done for you

	<p>Where did you find it?</p> <hr/> <hr/> <p>Object's name:</p> <p><u>Screw Coupling</u></p>
	<p>Where did you find it?</p> <hr/> <hr/> <p>Object's name:</p> <hr/>
	<p>Where did you find it?</p> <hr/> <hr/> <p>Object's name:</p> <hr/>


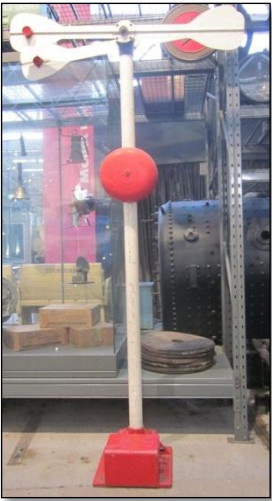
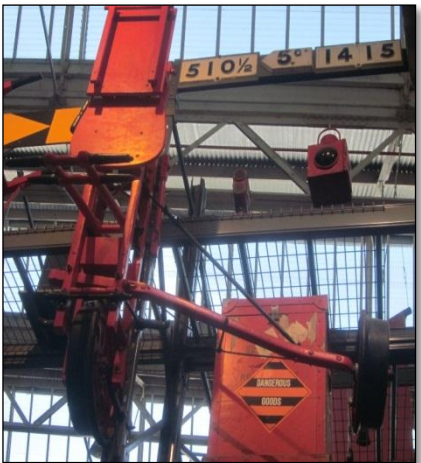
		<p>Where did you find it?</p> <p>_____</p> <p>_____</p>
		<p>Object's name:</p> <p>_____</p>

ZONE 5: ALL ABOARD

To find the information about the objects in this zone, you will need to read the interpretation panel that looks like this:



1. Find each object in the photograph. Locate its information on the interpretation panel. Write the name under each object's picture.

<p>Object 1:</p> 	<p>Object 2:</p> 	<p>Object 3:</p> 
<p>Name:</p> <p>_____</p>	<p>Name:</p> <p>_____</p>	<p>Name:</p> <p>_____</p>

Object 4:



Name: _____

2. Answer the statements about the object as true or false.

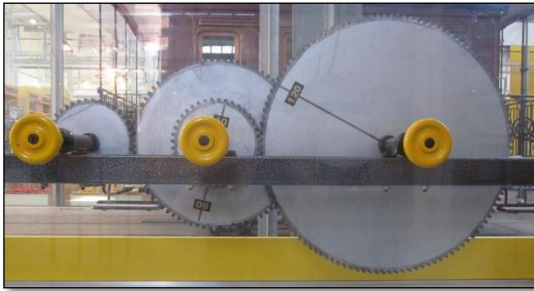
Questions:	True/False
1. Object 1 is a compound machine.	
2. Object 2 is a type of inclined plane.	
3. Object 3 has wheels and axles to help reduce friction when it moves.	
4. Object 4 has gears.	



3. Choose one of the objects and discuss these questions with your group:

- What does it do?
- What simple machine or machines are in that object?
- What forces are used to make it do work?

SCIENCE STATIONS



1. What simple machine is this science station?



2. Discuss with your group:

- Turn the handle on the small wheel on the left. What happens to the very big wheel on the right? Why?
- Turn the middle handle. What happens to the small wheel on the left? Why?
- Do all the wheels turn in the same direction? Why or why not?
- How does this type of simple machines help us move things?

1. What simple machine is this science station?

2. Discuss with your group:

- What happens when you lift the lever at each of the different marks?
- Which mark is the easiest to lift the weight? Why do you think this is so?
- Which mark is the hardest to lift? Why?
- How do levers help us do work, that is, what is their mechanical advantage?



ZONE 7: THE IPSWICH RAILWAY WORKSHOPS

1. Look in Harry Hyde's toolbox. Find an example of the following simple machines and write their names in the table.

Find an example of...	Tool name:
- a wedge	
- a lever	
- a screw	
- gears	

2. Look at the blacksmith's tools along the far wall of this zone.

- Draw a picture of:
 - Number 6 -Tongs
 - Number 7 - Cutter

Tongs:	Cutter:
---------------	----------------

- What type of simple machine are these? Circle the correct answer:

Lever

Wheel and axle

Inclined plane

ZONE 8: RAIL IN QUEENSLAND

Look for these clocks in this zone.

1. What type of simple machine is inside these clocks to make the hands move?

2. How does this simple machine make the hands move?



3. Discuss with your group:

- Why are clocks important in the railways?



ZONE 9: PLATFORM 9

Look for the scales and luggage trolley at Platform 9.



1. Circle the simple machines you can see:

Lever

Wheel and axle

Pulley

Inclined plane

Wedge

Screw

2. How would using these machines make work easier?



3. Discuss in your group:

- What other simple machines can you see on the platform and inside the refreshment carriage?

ZONE 11: MIGHT AND MUSCLE

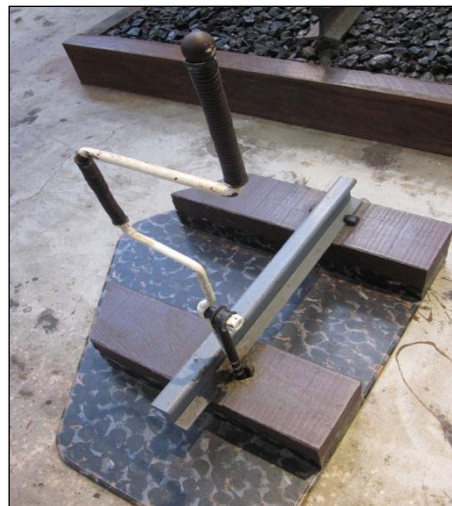
These items are all tools used in building the railways.
Can you find these tools in this zone?

1. Write the names of these tools under their pictures.
2. What simple machine or machines are in these tools?



Name: _____

Simple Machines:



Name: _____

Simple Machines:



Name: _____

Simple Machines:



Name: _____

Simple Machines:

3. What other simple machines can you find in this zone?

- Complete the table below. Remember some of the objects are compound machines and so will have more than one type of simple machine!

Levers	Wheels & axles/Gears	Pulleys	Inclined planes	Wedges	Screws



4. Discuss these questions in your group:

- How did these simple machines help in building the railways?
- Choose two machines from your table and describe how they work and which forces make the machine work.

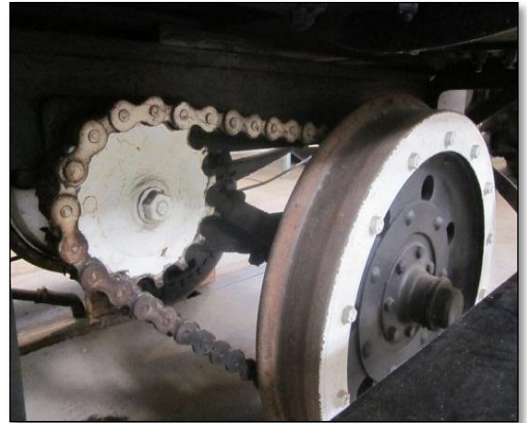
ZONE 12: ONE OF A KIND

1. Find the item in the photo. It is part of a much larger object. Answer the questions:

a. What is it?

b. What type of simple machine is it?

c. What larger object is it a part of?



d. What was the larger object used for?



2. Discuss with your group:

- What do you think it would be like to travel in this object?
- How comfortable do you think it would be?
- What would it be like to travel in when it is really hot, cold, or raining?

AFTER YOUR VISIT

1. Draw a picture of a museum object you saw on your visit to The Workshops Rail Museum.
 - Write the name of the object under your picture.
 - Label the simple machine or machines in your object.



Object's name: _____

2. Write a paragraph describing your object, including what it does, which simple machines are in it, and how it works:



3. Show your drawing to your group and talk about your object. Use the information in your paragraph to help you.



4. Class discussion:

- After visiting The Workshops Rail Museum, what have you learnt about simple machines?
- What roles do simple machines have in the railways, that is, what type of work do they help railway workers do?
- What would working on the railways be like without these machines?