

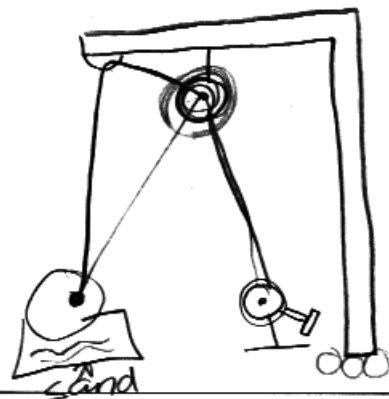
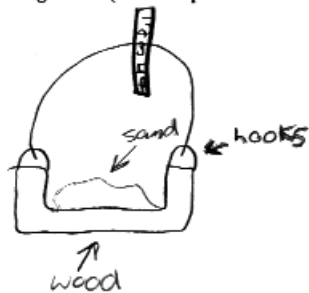
A

### Appendix 6 Making the Plan

1. Restate the Need

To rescue beached whales

2. Exploring Ideas: (Use the space below to illustrate your ideas.)



B

3. Select your preferred solution and explain why you've made your choice.

I selected solution #2 because I like to use pullys. <sup>2</sup>

4. Design Sketch (draw a clearly labelled design sketch of your solution on the back of this sheet or on graph paper). <sup>2</sup>

On graph paper

5. Outline the design process steps followed in constructing, testing, and revising your solution. These steps should only include the lifting mechanism construction, not the supporting structure. <sup>2</sup>

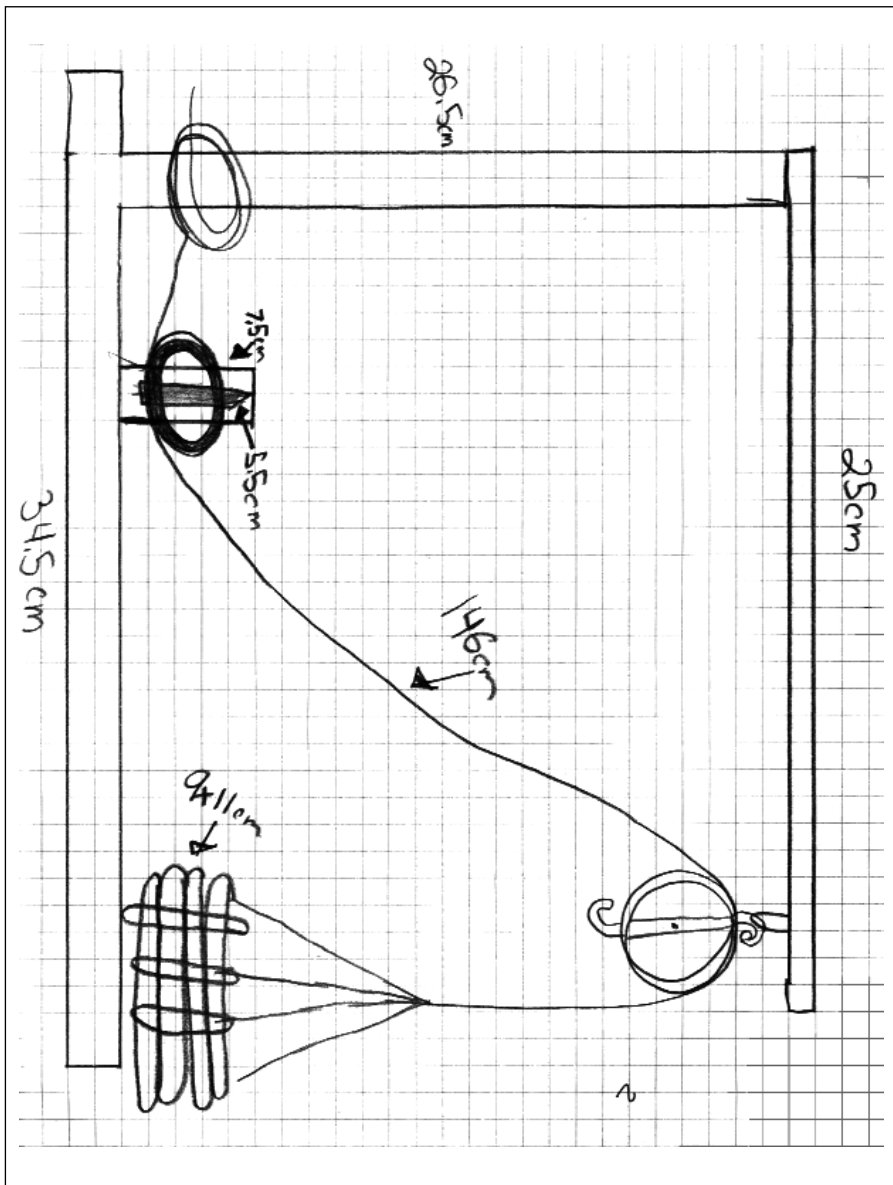
1) I took one of the pullys that had a hook at glued the hook to the top of my s.s.

2) I took a peice of wood and glued in onto the base so it was alligned with the other pully that I glued onto it.

3) I glued 2 pullys onto the shaft of the support. s. 1 higher than the other.

4) then I simply just threaded some string threw all of the pullys.

C



D

**Appendix 7**  
**Executing / Evaluating the Plan**

Observe and record data that show that your mechanism generates a mechanical advantage (MA) of at least 4. Show how you have applied MA calculations with an explanation. Show evidence verifying your results.

Pulleys

4 pulleys therefore a mechanical advantage of 4.

**E**

**Appendix 8  
Reflection**

2

1. Provide an **evaluation** of the strengths and weaknesses of your mechanism.

a) Strengths: My device is able to lift 500g's.

b) Weaknesses: The string falls off of the fixed pulley's a lot of the time.

2. Explain **how** your design could be improved.

The main way I can improved it is by taking more time to construct it. And by thinking of a way to make a device that would keep the string on track.

**F**

Reflection

My lift did complete the job that it was designed to do. It was able to lift the 500g's, (weight) and even a little more, even though the string fell off of the track a few times. Over all I am fairly happy with the way it all turned out.

**Teacher’s Notes****Understanding of Basic Concepts**

- The student demonstrates limited understanding in applying, calculating, and explaining mechanical advantage (e.g., [V] states that there is a mechanical advantage of 4; incorrectly bases the estimate of mechanical advantage on the fact that there are four pulleys in the mechanism).

**Design Skills**

- The student rephrases the problem/need with limited clarity (e.g., [P] Making the Plan [1]: “To rescue beached whales”; [V] in the presentation, expands on the need recorded in the written task: “... we need to be able to lift it 10 cm off the ground and then lower it 5 cm onto a hovercraft”).
- The student explores potential solutions in a limited way (e.g., [P] Making the Plan [2]: provides one clear design sketch of a pulley system and one that is unclear).
- The student selects a solution and provides a limited explanation for the choice (e.g., [P] Making the Plan [3]: “I selected solution #2 because I like to use pullys.”).
- The student creates a simple design sketch (e.g., [P] Making the Plan [4]: creates a sketch that shows the structure and dimensions of the device and provides measurements but no labels).
- The student outlines a few steps of the construction plan (e.g., [P] Making the Plan [5]: lists four steps but supplies few explanatory details: “I took one of the pully’s that had a hook at [and] glued the hook to the top of my s.s. [supporting structure]”).
- The student constructs a solution that meets the task criteria to a limited extent (e.g., [V] constructs a mechanism that partially performs the required work – lifts the prescribed weight only some of the time and not the required distance).

**Communication of Required Knowledge**

- The student presents the solution with limited clarity (e.g., [V] becomes distracted when the string comes off the pulley during the presentation; makes comments such as “I just thought of ...”).

- The student demonstrates with limited supporting evidence how the solution meets the task criteria (e.g., [V] demonstrates how the pulley system should work, but the mechanism cannot lift the load a distance of 10 cm).

**Relating of Science and Technology to Each Other and to the World Outside the School**

- The student provides a limited reflection on the strengths and weaknesses of the model (e.g., [P] Reflection [1a]: “My device is able to lift 500 g’s”; [1b]: “The string falls off of the fixed pully’s a lot of the time.”).
- The student suggests minimally appropriate improvements (e.g., [P] Reflection [2]: recognizes the need “to make a device that would keep the string on track.”).

**Comments/Next Steps**

- The student creates a clear and simple design sketch.
- The student should expand the restatement of the problem/need to include the design/construction challenge.
- The student should address all the criteria outlined in the task.
- The student should add explanatory detail when describing construction processes.
- The student should correct spelling errors by referring to resources such as wall charts and a dictionary.

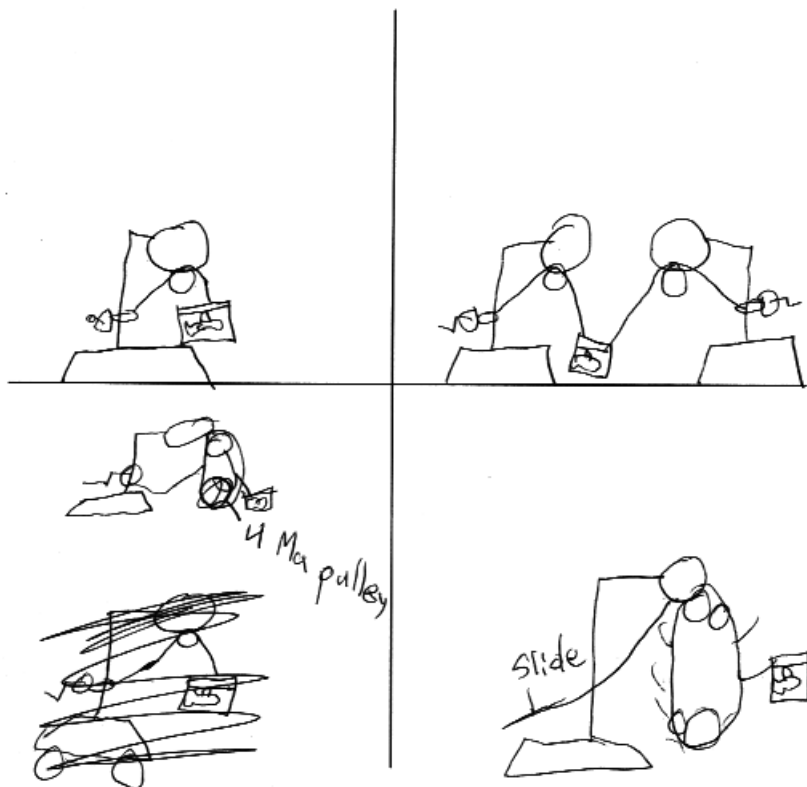
A

Appendix 6  
Making the Plan

1. Restate the Need

To move beached whales

2. Exploring Ideas: (Use the space below to illustrate your ideas.)



B

3. Select your preferred solution and explain why you've made your choice.

I chose No. 3 because It is the only one that has a MA of 4.

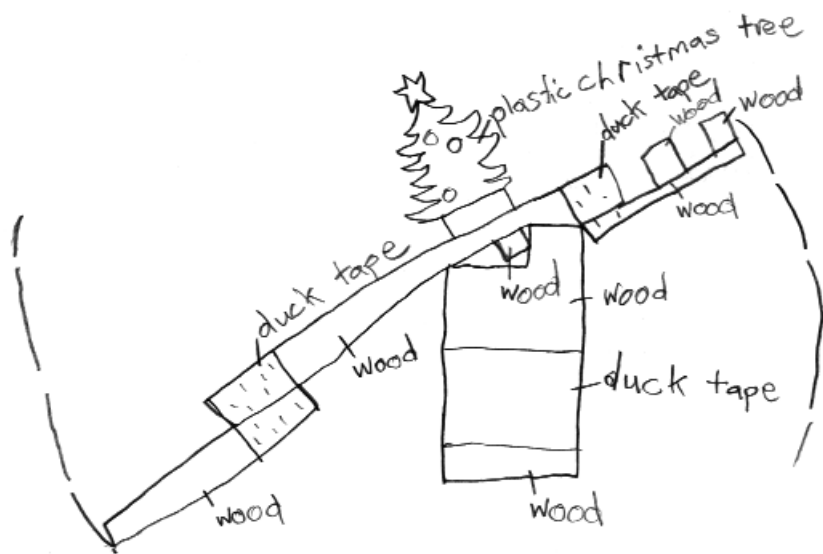
4. Design Sketch (draw a clearly labelled design sketch of your solution on the back of this sheet or on graph paper).

5. Outline the design process steps followed in constructing, testing, and revising your solution. These steps should only include the lifting mechanism construction, **not** the supporting structure.

⑤ The first thing I did was try and build a pulley system lifted by a crank. I found the string wasn't strong enough and the pulleys wouldn't stay in place. Then I realized that levers work the best so I glued and duck taped a structure together. I started with wheels but found that made it slip so I changed it.

C

# TREE PICKER



D

## Appendix 7 Executing / Evaluating the Plan

Observe and record data that show that your mechanism generates a mechanical advantage (MA) of at least 4. Show how you have applied MA calculations with an explanation. Show evidence verifying your results.

The effort arm is 4 times bigger than the load arm.

Since the effort arm is 4 times longer than the load arm you only need to put in  $\frac{1}{4}$  of the load arm to lift it.

$$MA = \frac{LF}{EF}$$

$$MA = \frac{1000N}{250N}$$

$$MA = 4N$$

### Appendix 8 Reflection

1. Provide an **evaluation** of the strengths and weaknesses of your mechanism.

a) Strengths:

The strength is it uses 4 or more mechanical advantage.

b) Weaknesses:

The arms could be a little stronger.

2. Explain **how** your design could be improved.

I could use a triangle shape base instead of a square and I could make the arms stronger. I might want to get wheels that work on it. That's how I could improve it.

### Teacher's Notes

#### Understanding of Basic Concepts

- The student demonstrates limited understanding in applying, calculating, and explaining mechanical advantage (e.g., [P] Executing/Evaluating the Plan: applies concepts incorrectly: “Since the effort arm is 4 times longer than the load arm you only need to put in 1/4 of the load arm to lift it.”).

#### Design Skills

- The student rephrases the problem/need with limited clarity (e.g., [P] Making the Plan [1]: “To move beached whales”).
- The student explores potential solutions in a limited way (e.g., [P] Making the Plan [2]: provides design sketches that deal only with pulleys, and two examples lack sufficient clarity; provides few and inadequate labels).
- The student selects a solution and provides a limited explanation for the choice (e.g., [P] Making the Plan [3]: “I chose No. 3 because it is the only one [one] that has a MA [mechanical advantage] of 4.”).
- The student creates a simple design sketch (e.g., [P] Making the Plan [4]: gives misleading title “Tree Picker” to the diagram, showing confusion about the mechanism’s purpose).
- The student outlines a few steps of the construction plan (e.g., [P] Making the Plan [5]: provides only general statements rather than a detailed description of steps: “... I realized that levers work the best so I glued and duck [duct] taped a structure together. I started with wheels but found that made it slip so I changed it.”).
- The student constructs a solution that meets the task criteria to a limited extent (e.g., [V] constructs a mechanism with an unstable fulcrum and lever).

#### Communication of Required Knowledge

- The student presents the solution with limited clarity (e.g., [V] uses the word “thing” to refer to the whole mechanism and its parts).
- The student demonstrates with limited supporting evidence how the solution meets the task criteria (e.g., [V] demonstrates how the lever should work, but the position of the student’s hand on the lever in the video makes it unclear whether the load is raised 10 cm).

**Relating of Science and Technology to Each Other  
and to the World Outside the School**

- The student provides a limited reflection on the strengths and weaknesses of the model (e.g., [P] Reflection [1b]: states that “The arms could be a little stronger”).
- The student suggests minimally appropriate improvements (e.g., [P] Reflection [2]: proposes a triangular shape rather than a square shape for the base but does not explain the purpose of the change; also suggests “I could make the arms stronger” to solve the problem identified in [1b]).

**Comments/Next Steps**

- The student’s choice of a lever is a simple, sensible solution to the problem.
- The student should expand the restatement of the problem/need to include the design/construction challenge.
- The student should outline the design/construction steps in more detail.
- The student should review the steps in applying, calculating, and explaining mechanical advantage.