

## 8.8P Project : Design a Motorised Crane

### Your Task:

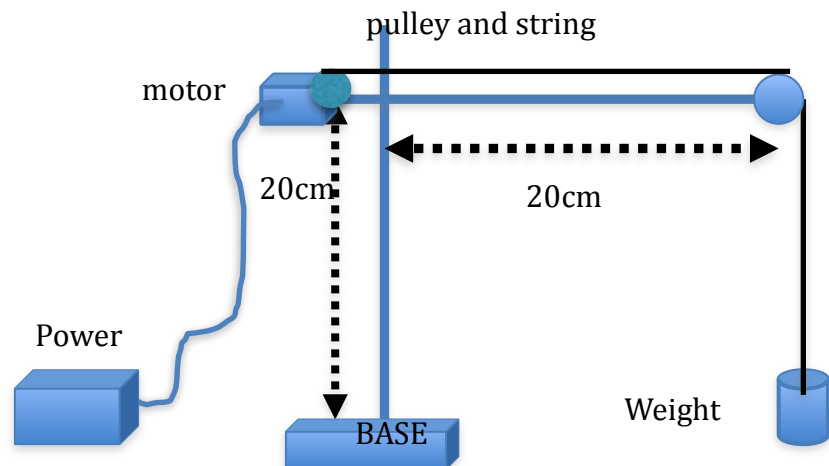
Plan, design and build a motorized crane, that will lift as much weight as possible. You are limited to a crane no more weight than 500g.

You can use LEGO, balsa or other building materials.

Pulleys, gears, levers and wheels can be used.

The motor should be a low powered 6-12 Volt DC Motor.

Weights should be measured and can hang from the crane arm.



### Building Criteria

- The crane must be a minimum of 20cm in height (to the arm from the base)
- This crane arm must extend a minimum of 20cm from the base to raise the weights at least 10cm..
- The base cannot be fixed to the desk but can be wide enough to support the centre of balance.
- The motor has to be controlled by a 6-12V battery.
- The weight of the crane used is limited to 500g. (not including the power source)
- You can use devices to aid lifting including pulleys, gears and string.
- String can also be used to stabilise the structure. You are limited to 1 m of string altogether.

**How you will be assessed**

There are three parts to this assessment you need to submit:

1. The Design and Construction of the Crane must include a **Folio** which shows a progression of draft diagrams and measurements (see Log page templates attached).
2. Display a photo or diagram labelled showing Forces involved when lifting weight.
3. Report on your final outcome, minimum 250 words. This must include:
  - a. Your Best Weight ratio Score =  $\text{Weight Lifted} / \text{Weight of Crane}$
  - b. Explanation of how you kept the Crane stable.
  - c. Explanation of how you reduced energy losses to make the lifting more efficient.
  - d. Overall how effective was your Crane and what limitations would need to be overcome for a full scale application?

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**Log Template of My Design and Testing Results**

Name: Other team Members:

Day 1

Designs – show where main forces act.

Day 2

Tests

1. Weight it lifted.
2. Changes I made, new weight lifted:
3. Further Changes, weight lifted:

Day 3

Changes I made today

Final Weight of Crane:

Final weight it lifted

My best lifting Score

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Criteria for Marking Sheet

Elements:

Knowledge: Forces identified, Energy losses identified

Investigation: Plan Investigations. Design. Conduct tests. Identify problems. Draw conclusions

Communication: Explaining function. Clear diagrams

Reflection: reflect on learning and adjustments for better outcomes.

Criteria	A	B	C	D
Knowledge:	Comprehensive Knowledge and appropriate application of the task to science concepts learnt.	Thorough Knowledge and application of the task and Physics involved.	Satisfactory Knowledge and application of the task and Physics involved.	Limited Knowledge and application of the task and Physics involved.
Design, Test and Modify Construction:	Detailed evidence of progression in designs.	Evidence of some progression in designs.	Designs presented	Some design effort
	Results show thorough and fair testing	Results show fair testing	Some Testing done	
	Applied test results well to complete an effective and very efficient product.	Completed an effective and efficient product.	Completed a product that is efficient.	Completed a product that works.
	Lifting Score > 2	Lifting Score > 1	Lifting Score > 0.5	Lifting Score <0.5
Communication: In explanation of how construction is stabilised and made to increase efficiency, the student	Explains accurately and clearly how their design works, using correct scientific language and detailed diagrams.	Explains clearly their design and uses correct scientific language and clear diagrams to illustrate.	Explains their design. Uses diagrams and scientific language.	Explanation and diagrams attempted.
	Modifications clearly explained.	Modifications explained.	Evidence of Modifications	
Reflection	Insightful answers to effectiveness of product and adjustments required for a more effective working crane.	Correct answers to effectiveness and limitations of crane.	Answers show some reflection of limitations	Limited or no reflection.

