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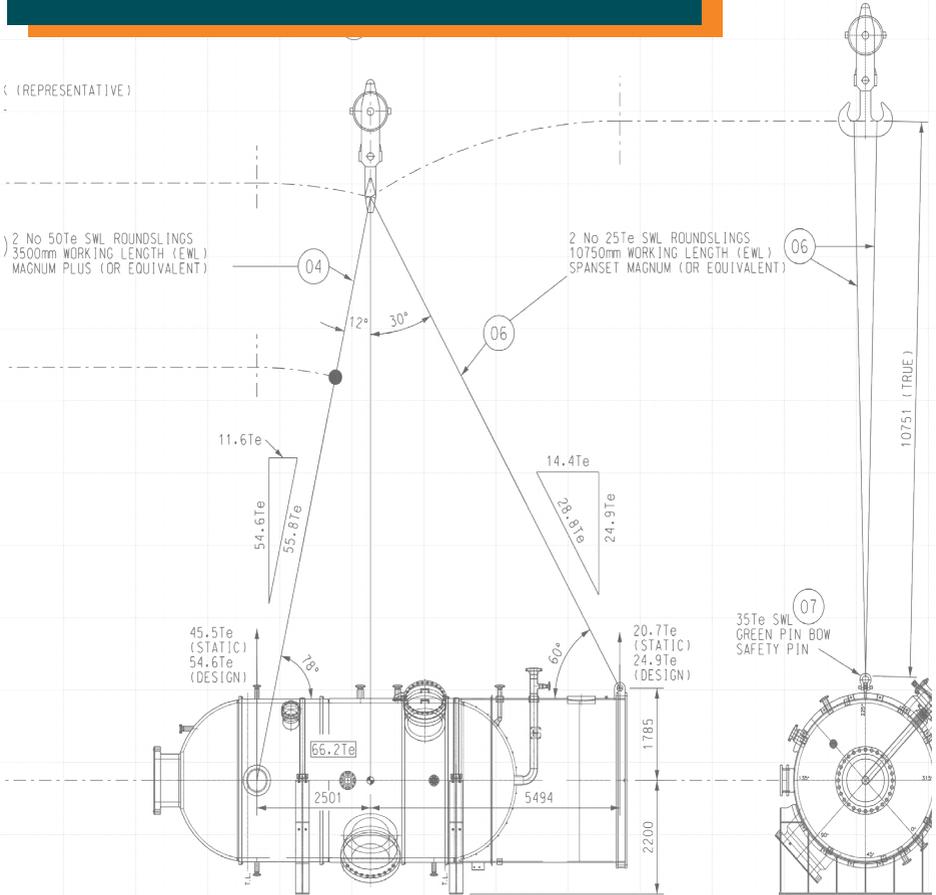
# MALIN YOUNG ENGINEERS

IN HOOK

( REPRESENTATIVE )

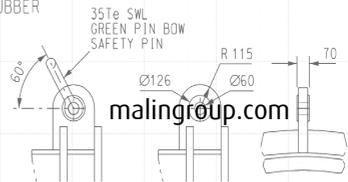
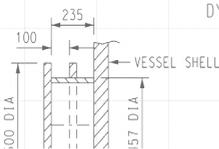
2 No 50Te SWL ROUNDSLINGS  
3500mm WORKING LENGTH (EWL)  
MAGNUM PLUS (OR EQUIVALENT)

2 No 25Te SWL ROUNDSLINGS  
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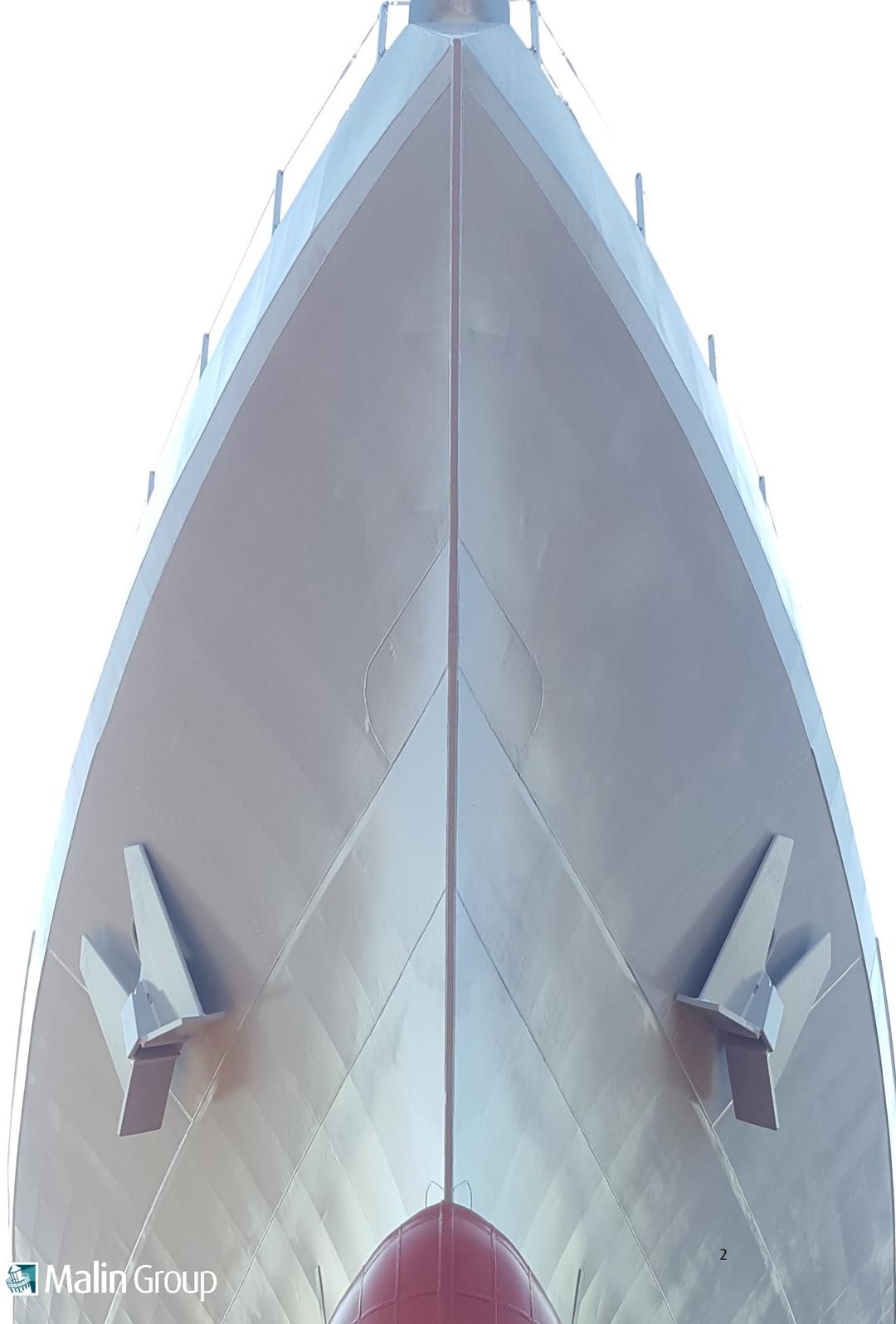


HORIZONTAL LIFT ARRGT - TURBO EXPANDER SCRUBBER  
VESSEL WEIGHT 66.20Te  
DYNAMIC AMPLIFICATION FACTOR 1.20  
DESIGN WEIGHT 79.44Te

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14Te

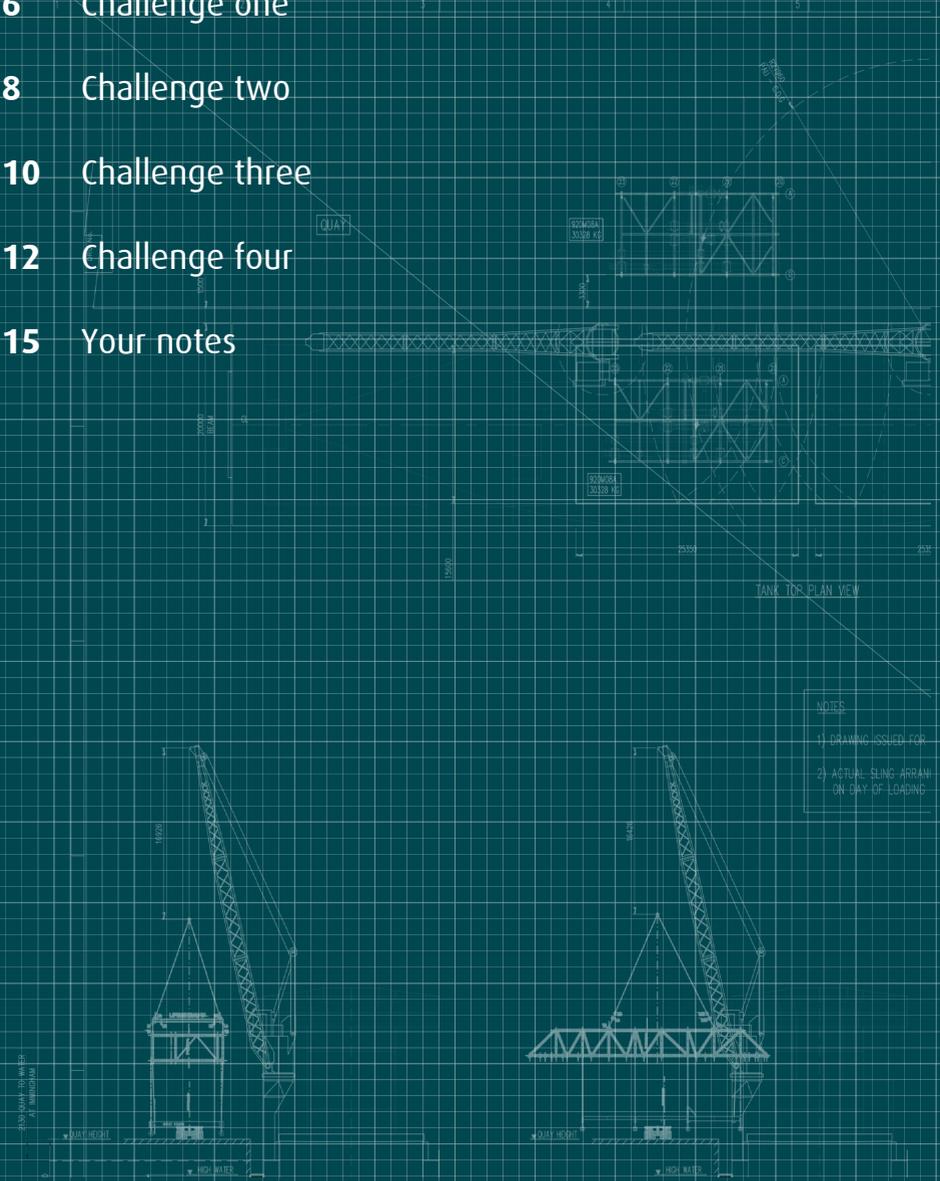


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# INTRODUCING MALIN YOUNG ENGINEERS

The Malin Group consists of a varied mix of talented individuals, who span a number of specialisms, from naval architects, design draughtsmen, structural engineers and project managers, to lifting engineers, heavy haulage experts, project managers and marine operations personnel. All have a passion for problem solving and are very creative - and all took a real interest in science, technology, engineering and maths (STEM) at school.

Our team work on designing, building, launching and maintaining ships, as well as calculating how best to move materials from A to B - that may be using a trailer, or maybe a crane. They also test the strength of structures and get involved in 3D modelling. They work on projects all over the world, and work for people such as Rolls Royce, FH Bertling, BP, BAE Systems - even the Ministry of Defence.

We are committed to supporting the next generation of engineers, so have come up with a range of challenges for you - a Malin young engineer - to complete. We hope you enjoy them, and who knows, we may be offering you a job in a few years time!

OUR EMPLOYEES WORK IN A VARIETY OF PROJECTS, ACROSS  
A RANGE OF SECTORS, ALL OVER THE WORLD



# CHALLENGE ONE: PULLEYS

## WHAT ROLE DO PULLEYS PLAY?

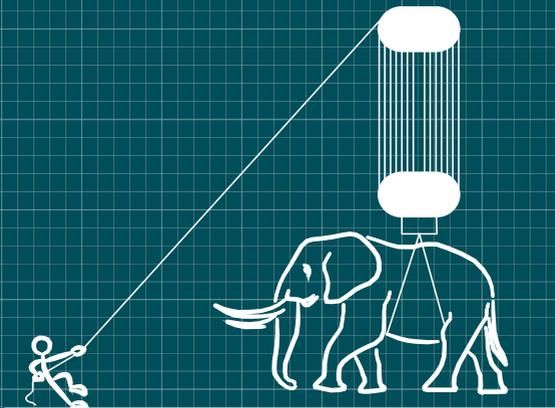
For this challenge you are going to learn how to magnify force using pulleys. Pulleys are all around us. On sailing ships they allow a little effort to be multiplied many times over meaning one man pulling on a rope can hoist a sail weighing much more than they do.

## AND HOW DO THEY WORK?

Pulleys are made up of spinning sheaves separated by cheek plates and connected by a single long rope. Each time the rope does a circuit, it increases the pulling force available.

For example, looking at the figure to the right, below, if we take a rope and pass it up over a pulley once, you need to pull the rope hard enough to take the full weight of the thing you are lifting... hard work.

If you pass through another pulley attached to the item you are trying to lift... the force you need to pull is halved. And every time you go round and round, the load appears to get lighter and lighter.



## THE CHALLENGE

Build a working pulley from stuff you can find around the house or garage.

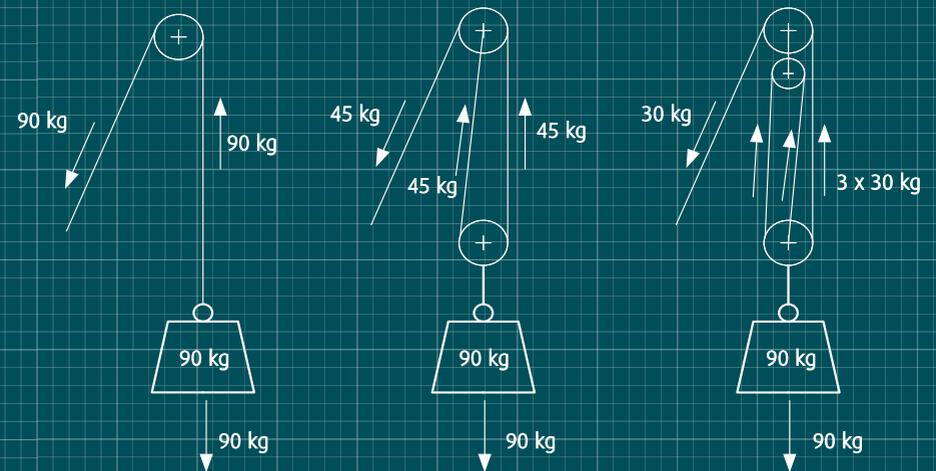
The key things your pulley will need to have is a rotating element (the sheave) that the rope passes over. This should have a groove to stop the rope falling off and be joined together so you can attach your load to it.

## TOP TIP

Tubes over pencils are a top tip... lego car wheels without the tyres are perfect!

## BONUS QUESTION

Pulleys are great for magnifying pulling force but what's the down side 'cos you never get something for nothing in Engineering...there's always a trade off.



## CHALLENGE TWO: BRIDGES

### THE IMPORTANCE OF BRIDGES?

For this challenge you are going to learn how to build a bridge. Bridges are everywhere. Some of the most famous include Tower Bridge in London, the 1.7 mile long Golden Gate Bridge, Clyde Arc, Sydney Harbour Bridge and the Milau Viaduct. Bridges are built with the purpose of spanning a large distance without buckling, often taking great weights.

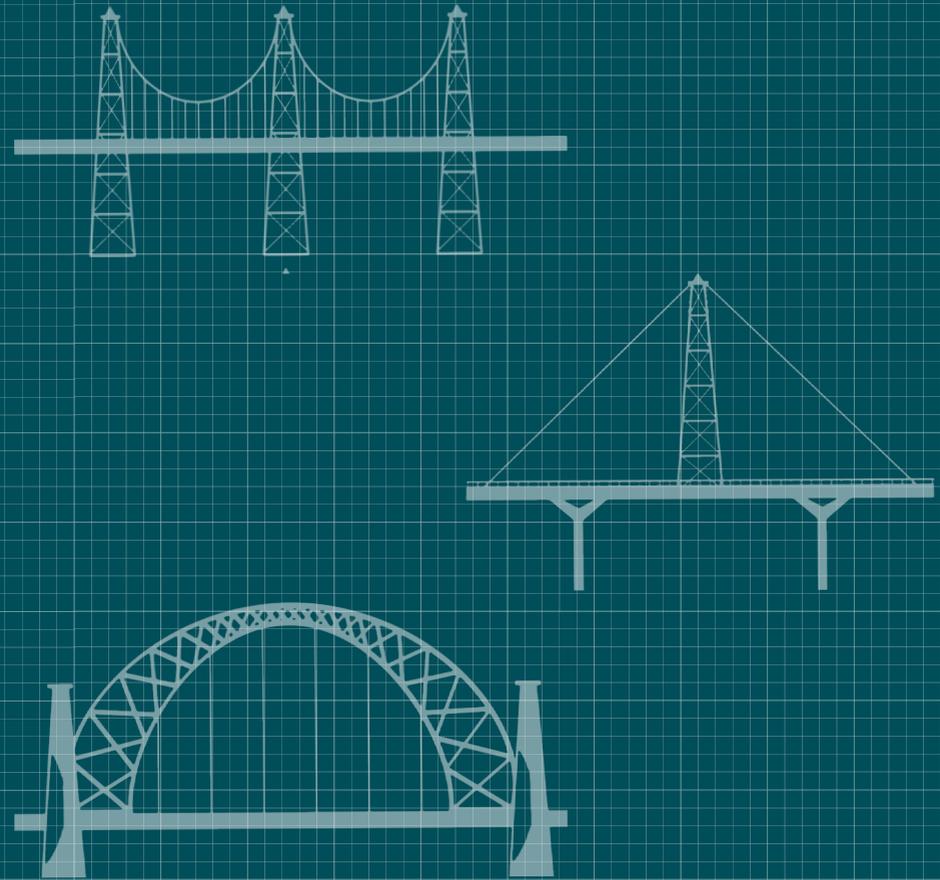
### WHAT TYPES OF BRIDGES ARE THERE? AND HOW DO THEY WORK?

There are a number of different types of bridges, all of which are constructed slightly differently:

- **Truss bridges** - all beams are straight, with trusses made of lots of small beams placed together - they can take large weights and span great distances;
- **Arch bridges** - a classic, older style, these suit stone and are often used across water;
- **Girder bridges (beam bridge)** - the most simple and common type. A log across a stream is an example of this;
- **Cable stayed bridges** - this is typically a continuous girder with one or more towers in the middle of the span and cables come down from the towers to support the girders. This type of structure is very durable and flexible.

### THE CHALLENGE

Design and build a bridge that will carry a load using only spaghetti and glue, wool, tape, string - whatever else you have in the house that will stick or bind! There are a few key elements - your bridge should be free standing and should span two surfaces. It should also include a decking of spaghetti to provide a suitable road surface at least 5 cm wide across the full span of the bridge and be able to carry a toy car or similar item without failing.



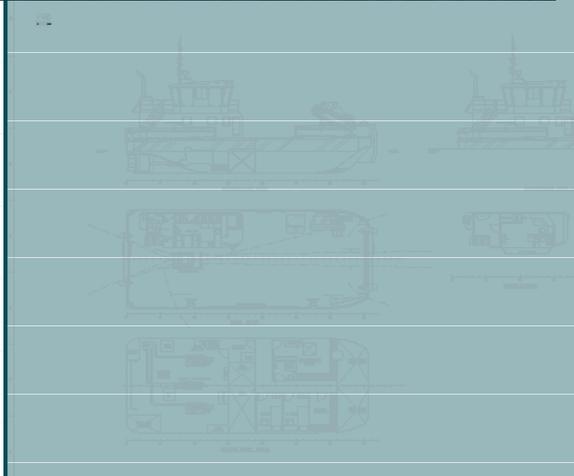
### TOP TIP

Your pasta may be carved, notched, steamed, boiled, and curved - but cannot be painted!

### BONUS QUESTION

The Sydney Harbour Bridge was built in what year?

## CHALLENGE THREE: SHIPS



### THE IMPORTANCE OF SHIPS?

For this challenge you are going to learn how to build a ship. Did you know that ships are still responsible for shipping goods across the world - £571 million pounds of chocolate was shipped last year alone - that's a lot of chocolate! Outside of transporting goods, there are also fishing boats, cruiseships, tug boats, yachts, lifeboats - so many uses for ships in today's world.

### HOW DO THEY WORK?

Despite being often very large structures, ships, as we know float - but how is this the case? An object will float if the gravitational (downward) force is less than the available (upward) buoyancy force. So, in other words, an object will float if it weighs less than the amount of water it displaces. This explains why a rock will sink while a huge ship will float. The rock is heavy, but it displaces only a little water.

### THE CHALLENGE

Design and build a ship that will carry a load of one standard food tin - beans, soup - you decide the cargo! You should use household items - whatever you have that will float! There are a few key elements - your ship should be able to stay upright in water for at least 10 seconds with its cargo, and should remain water tight.

### TOP TIP

Think about volume - you want to build a ship that displaces enough water to balance its weight - the heavier the materials, the more weight to displace.

### BONUS QUESTION

Ships move in 'knots' - that's the unit used for ships to measure their speed. But one knot is equal to what speed in miles per hour?

## CHALLENGE FOUR: LEVERS

### THE IMPORTANCE OF LEVERS?

For this challenge you are going to learn about the importance of levers. When working on any engineering project, you will often be required to move heavy or awkward loads - and the trick is to do so in the most efficient way. A key thing to help in this is levers. There are three varying types of levers: first, second and third class. The difference between each depends on where the force is, position the fulcrum is placed and the load position - however all work to assist in moving a load.

### HOW DO THEY WORK?

A key machine in engineering, levers require four elements:

- a beam/rod
- a fulcrum or pivot point
- an input force (effort)
- an output force (load/resistance)

The beam should then be placed so that it rests, at least at one point, on the fulcrum. When force or effort is then applied to the beam, it pivots around the fulcrum to move the object or load. As such, levers do not actually reduce the effort required to move an object - rather they spread the force required over a longer distance.

### THE CHALLENGE

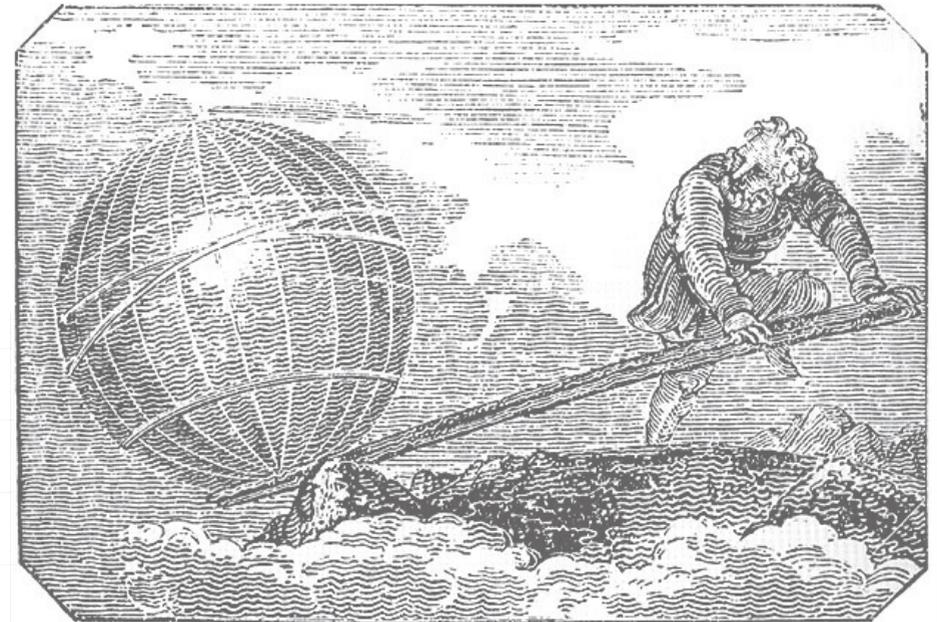
Design and build a lever that will lift a load of your choice! You should use household items - whatever you have to hand! There are a few key elements - we want to see:

- where you place your fulcrum
- what length your beam is

And then tell us what impact each of these factors has on the ease of which you may lift your load.

### TOP TIP

Think about force and distance - you want to create a lever that is long enough to lessen the weight of the load.



*“Give me a lever long enough and a fulcrum on which to place it, and I shall move the world.”*

### BONUS QUESTION

There are three classes of levers - can you provide an example of each type?

# WORKING WITH US

THE MALIN GROUP OFFERS YOU AN EXCITING RANGE OF EMPLOYMENT OPPORTUNITIES, SPANNING A VARIETY OF SPECIALISMS.

With the Malin Group, you are not just joining a team, you're becoming part of a family. Our headquarters, based in the South Rotunda reflect our group and culture - heritage teamed with innovation and creativity. Inside this historic building, classic features are teamed with modern facilities for our staff to enjoy - including pool table, ping pong, communal lounge area with fresh fruit and snacks, PS4 and a climbing wall. Our conference room also allows a 360 view of the city centre. We have regular social events, including First Friday Drinks, client football matches, and an Annual Ceilidh - plus we have a few office dogs on occasion, which is always a nice addition.



# YOUR NOTES



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