



# GCSE Design & Technology

SEAFORD COLLEGE

HEAD OF DESIGN & TECHNOLOGY – MR D SHAW



# Why should you choose Design & Technology?

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- GCSE Design and Technology will prepare students to participate confidently and successfully in an increasingly technological world.
- Students will gain awareness and learn from wider influences on Design and Technology including historical, social, cultural, environmental and economic factors.
- Students will get the opportunity to work creatively when designing and making and apply technical and practical expertise.

# Course Aims and Content



Initial projects focus on developing, designing and give students the opportunity to work with new materials & equipment

The aim of the course is to build on the student's experiences at Key Stage 3 in preparation for their GCSE controlled assessment and examination.





# Assessment & Expectations of students

## Two units overall - Exam and Coursework in Year 11

Skills required :

- Enjoy Design & Technology – designing, making products, learning about processes and CAD/CAM
- A good drawing ability or the willingness to develop drawing skills
- To work to a high standard and manage their own time

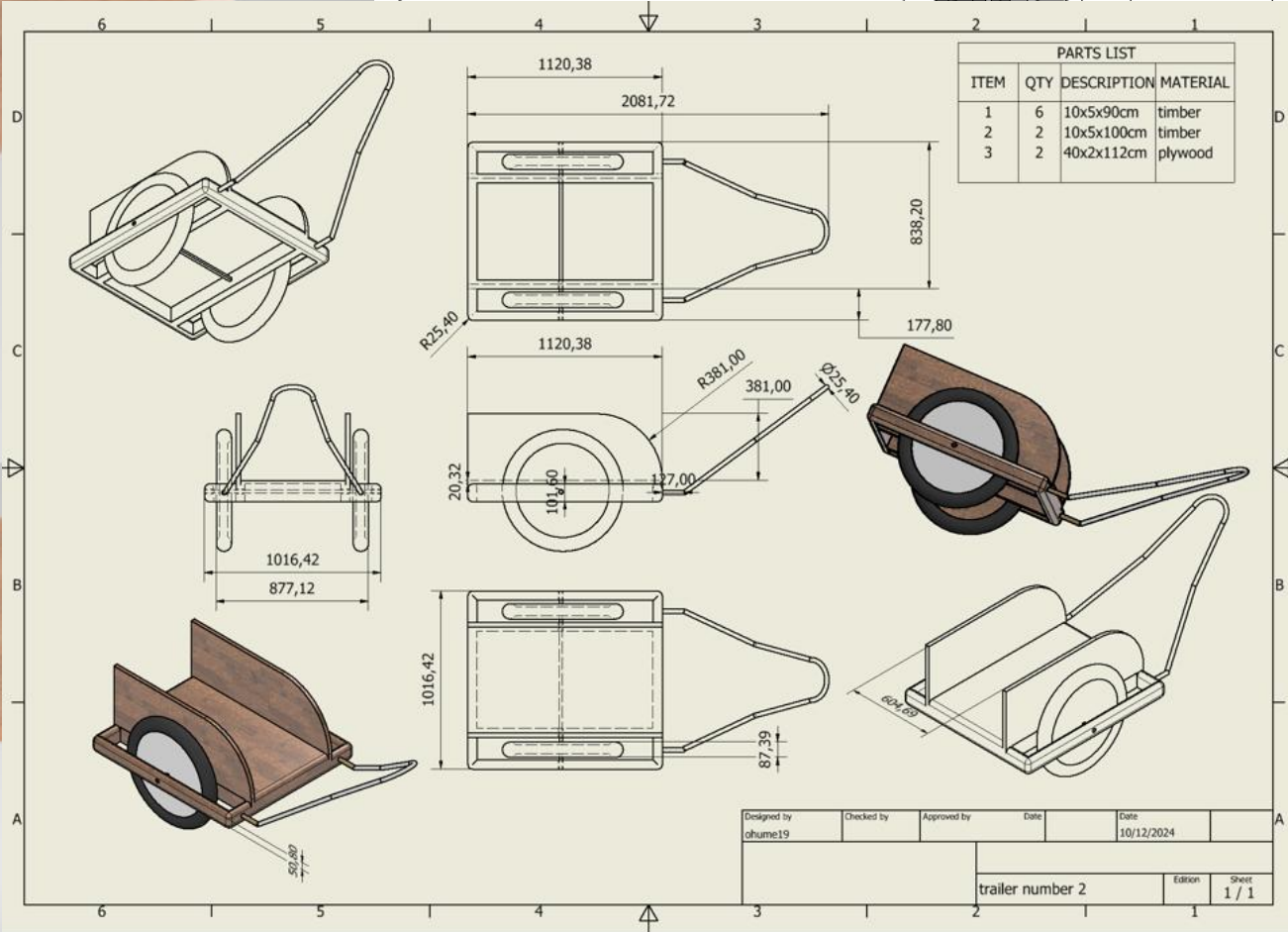
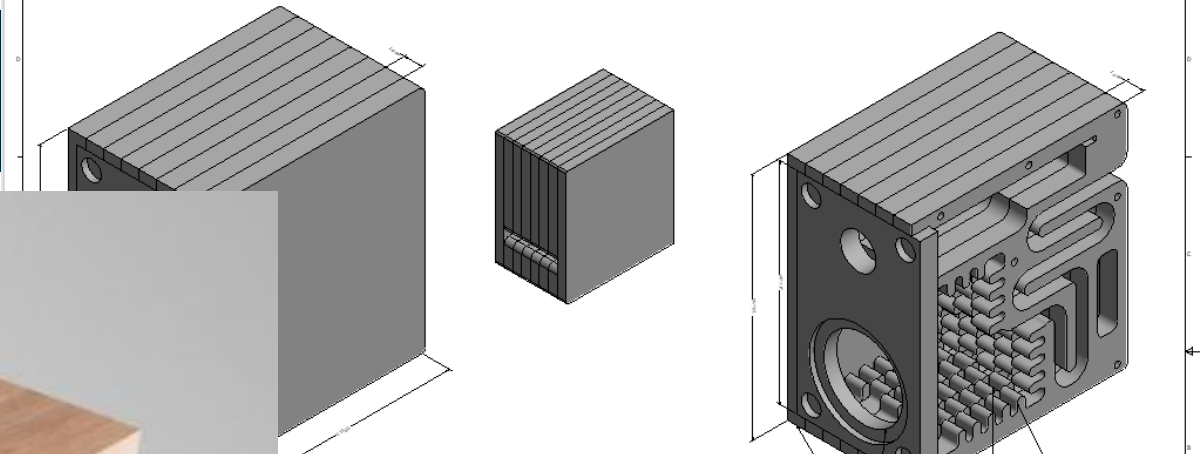
Coursework consists of a finished product and a portfolio 50%

Examination at the end of the course 50%

Dedicated text book & revision guides

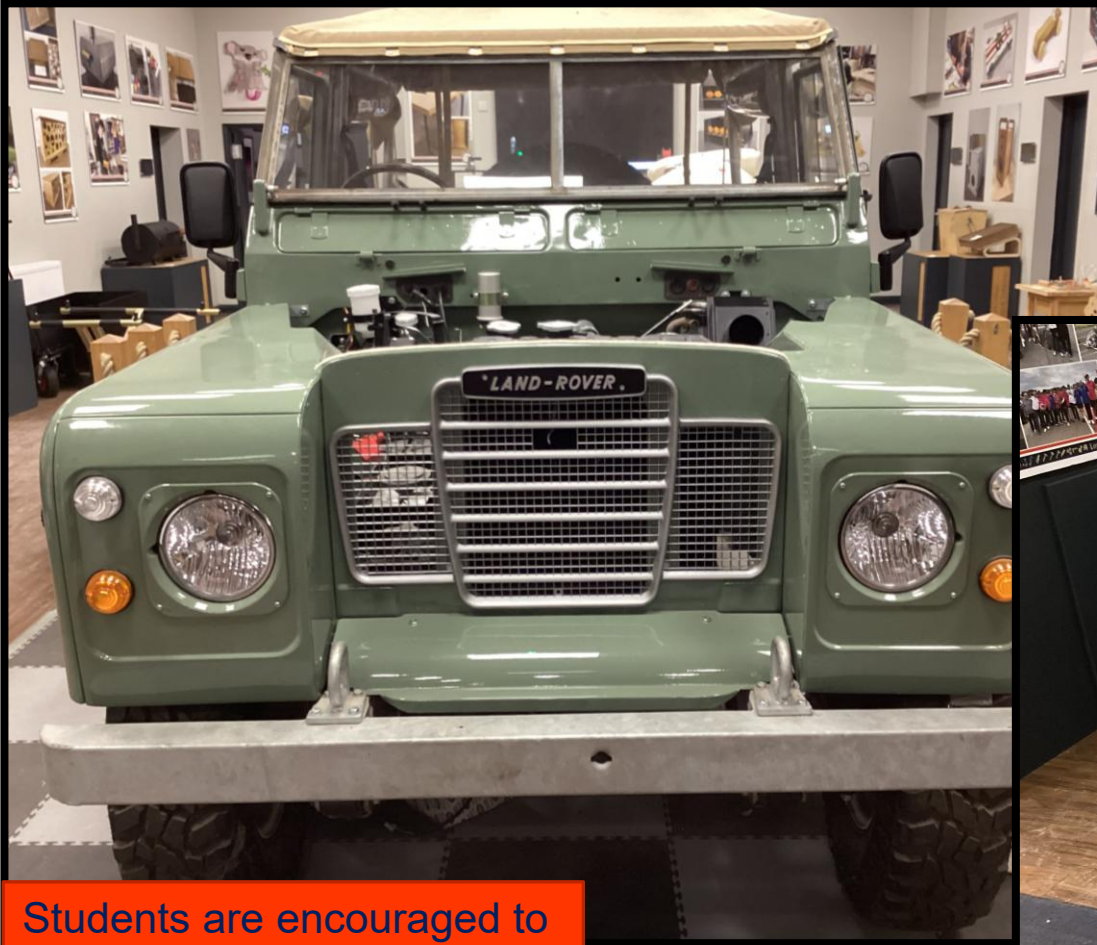


# CAD & 3D Printing





# Get Involved!

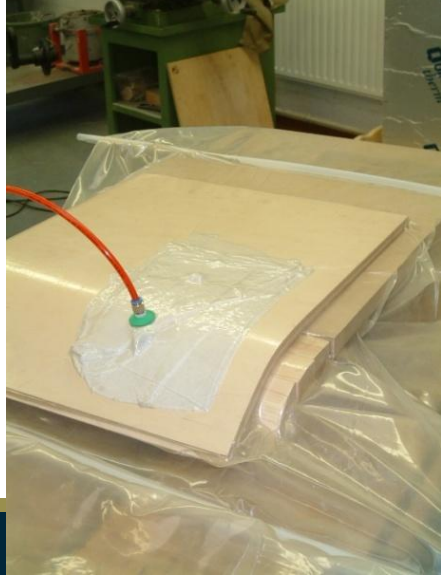


Students are encouraged to get involved and participate in extra-curricular activities such as Greenpower, Land Rover Restoration and other competitions.





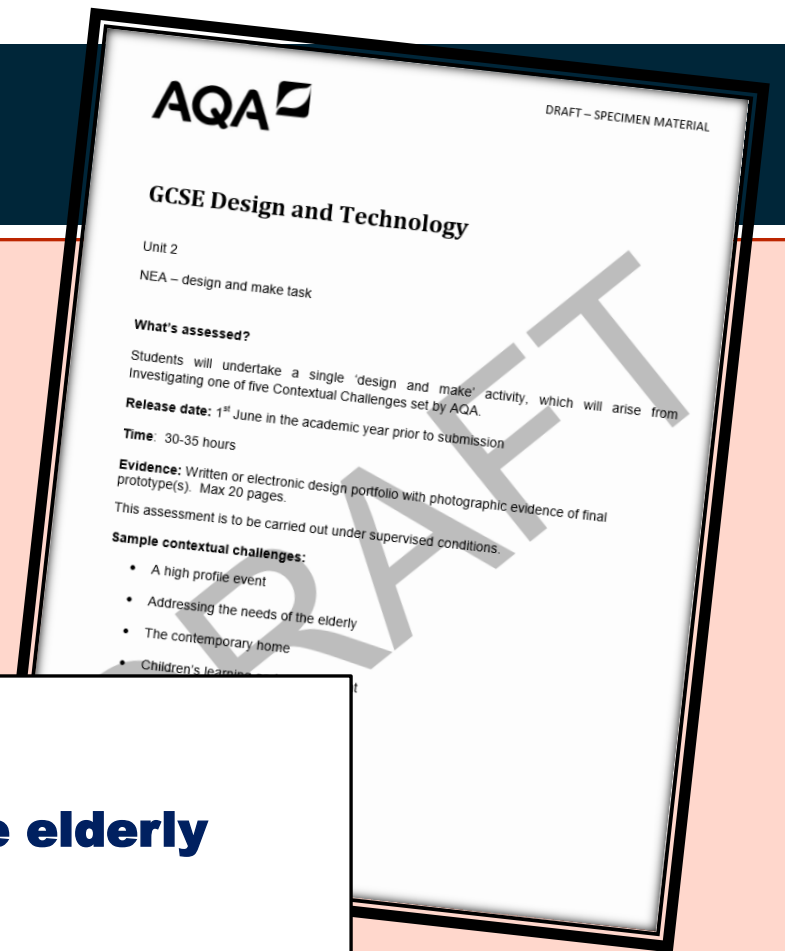
# Resistant Materials Skills



# Controlled Assessment

- Students must select a controlled task from those set by AQA late in the summer term.
- Controlled conditions.
- 30-35 hours / 50% of marks
- Students can choose from 5 set contexts

- **A high profile event**
- **Addressing the needs of the elderly**
- **The contemporary home**
- **Children's learning and development**
- **The world of travel and tourism**





# Detailed Design & Development Pages

## Generating Designs:

**My opinion:** I really like this design because of its shape. Having this dome shape not only looks good but it will increase the sound quality because it has a round enclosure. I think that this design will be a bit of a challenge for my clients needs.

I will manufacture the enclosure of this design on a 3d printer.

This design will feature a Dayton audio Neodymium tweeter

The rough dimensions of this set of speakers will be: height: 25cm, length: 15cm, width: 12cm.

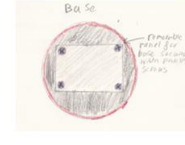
This design will feature a red gloss paint work for the main enclosure.

**Evaluation:**  
This design my clients like but think it might not fit in with their decor of their living room. They like the shape of it and they think that the speaker looks very good. They also think that this design has met all the design requirements such as easy to clean. I also think this design is a bit small to go next to my clients tv cabinet. I don't think that I will continue to make this design because of its color and size.

The enclosure of my design will be made out of a composite of wood and PLA filament.

Using a 3d printer and a composite filament will allow me to get a very unique design.

This design will feature a Dayton audio 4 inch driver.



Specification:	Has it been completed?
Sustainability	No because the design is not sustainable.
Materials and components	No because the design is not made from MDF.
Quality	No because the design will be 3d printed
Aesthetics	No because the design will not blend in with my clients decor.
User needs	Yes I think I have met the design requirements.
Performance Requirements	No because the design does not fit in with my clients decor.
Form and function	No because the design is not 60cm tall so I will need to make stands for the speakers to sit on.

The front panel of this design will come out this will allow me to access the speakers and apply the sound insulation foam. It will be glued down.

### Advantages:

The process I will use to make these speakers is 3d printing. I will use a 3d printer pictured above this will mean I can get a custom shape and size.

### Disadvantages:

A disadvantage of 3d printing is it is very time consuming to print this design it will take over 48 hours running just one machine.

### First CAD design of the shooting target

The back of this target is a curve so the bullets are kept in the shooting target because the bullets are not ricocheted out of the target into the garden or at the user which would be dangerous.

These targets are different sizes which is what my users wanted so there are different so some of the targets are more difficult to shoot down. Also this means that my user is more likely to get better at triathlon shooting meaning that Piers could be more successful in this high-profile activity or occasion.

This lever is attached to the mechanism so when the user pulls the rope which would be attached to the lever than the lever would be lifted up which turns the mechanism towards the user which in turn lifts the targets.

This is extra material which sticks out of the targets bottom cylinder like a triangle so when the target is reset then the target can rest on them so it stays upright.

### Positive user feedback

- Piers said, "I think the mechanism has work very well enabling the targets to be reset which is what I wanted so I don't have to put the targets back up when I shoot them down."
- Tania said, "I think the shape of the shooting target is good and would mean the bullets would not be able to bounce out meaning that the garden would be a nice place because they would be no bullets littering the garden."

### Negative user feedback

- Tania said, "I think that the part of the actual target which holds the targets head upright is too long because the bullets may potentially bounce out from the head of the target being so high up."
- Piers said, "I think this target looks quite heavy so I would not be able to carry to some areas of the garden."

### Improvements for the target

- I will make the stands for the targets shorter to make sure the bullets stay in the target.
- I will make a bend on the top piece of metal so the metal will be stronger and so not have the possibility of bending.
- I will use thin pieces of metal when I can so the target will be lighter for my user to carry around the garden.

## Design 4

This shows where the bolts would connect to the target so the mechanism would be stable and so perform its job properly.

These pictures are examples of bolts that I could use

These bolts are made from alloy steel, so they are a high strength steel meaning they will last for a very long time

## Designs for a shooting target

This is something that Piers wanted because he said to be able to re-use the bullets, so I don't have to buy more.

This is a metal box that I made in the workshop for the designs and materials I chose for the target. This gives me a really good representation of what this bullet holder would be like



This drawing shows a mechanism. I have designed this, so the targets are able to reset when my users shoot the targets down

This is what Tania wanted because she said the garden to stay cleaner and a nicer place to be in.

I have designed this roof to be curved so when the bullets hit it the bullets just deflect down into the bullet holder

This is a bullet holder which allows the bullets to be stored all in one place so the user can easily pick them up and re-use the bullets

This is a metal bender that I used to make this box.

Then when the mechanism resets the target than the block can keep it in position

This is a block, the target can rest on and be stable until the user shoots it down.

This is a metal lever joint allowing the target to go backwards and forwards easily so the bb bullets could knock the target down.

This is a bullet catcher and stops the bullets from bouncing out from the target

Tania likes this because she said the shooting target should have a bullet catcher, so the garden won't be littered with air soft bullets.

This supports the target, so it can balance easily

The bottom of this target is angled so the bullets will always roll down into the bullet holder

This target is angled down so when the bullet hits the target then it will bounce down and say in the target with help from the bullet catcher this is what Tania wanted.

This metal block will support my target, so it stays upright till my users shoot them down

This is the lever that attaches to the mechanism so it can be pulled to bring the mechanism up.

This means that when the user pulls the rope then the lever lifts the mechanism, so the targets are re-adjustable

I could make this out of plastic because it doesn't need to be strong and plastic is easy to bend. This is how you bend plastic

This is something that Piers wanted because he said, For the targets to be resetting, so I can keep on shooting without having to get up and reset them.

When the mechanism goes up than the targets are re-adjusted to their original position

This is an example of a metal lever

This is a metal bender that I used to make this box.

This target is angled down so when the bullet hits the target then it will bounce down and say in the target with help from the bullet catcher this is what Tania wanted.

This metal block will support my target, so it stays upright till my users shoot them down

This is a metal lever joint allowing the target to go backwards and forwards easily so the bb bullets could knock the target down.

This is a block, the target can rest on and be stable until the user shoots it down.

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Kristian Fairston

Candidate Number: 2031

Seaford College

Centre number: 64159

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**Client comments:** We really like the bees wax finish for the front walnut panel because it will blend in with our decor and it is not too glossy. The miter joint will also be perfect.

This is a Lap joint. There is two way I can create this joint. 1. I can use a table saw and create a channel. 2. I can use a table router with a straight carbide bit to create a channel

This is a Miter joint. I can use this joint. 1. I can use a 45 degree router bit and rout the edge. 2. I can use a table saw with the blade set at a 45 degree angle. 3. I can use the jointer planer and set the guard to 45 degrees. This is what I did for my test piece above.

Timber I am going to use: The Timber that I am going to use for the front panel is American Walnut. I wanted to experiment and find out the best finish I can use to finish the front panel of my speakers. I got 5 pieces of American walnut and applied 4 different finishes and left one block of wood with no finish I did this to determine the best finish for my design.

Below is the Bees Wax finish. I applied this by getting a rag and placing a dollop on the rag. I then rubbed it into the wood. And let it be absorbed. This is in my opinion the best joint it is not too glossy and not too unfinished it is perfect. This is clearly my client favorite finish and it is my favorite finish as well. This is the finish that I will use in my final design.

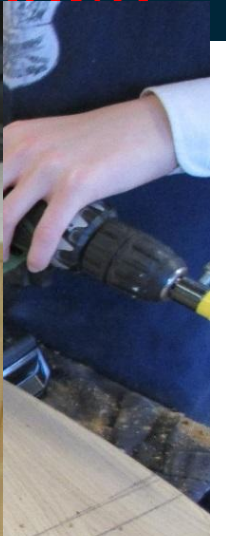
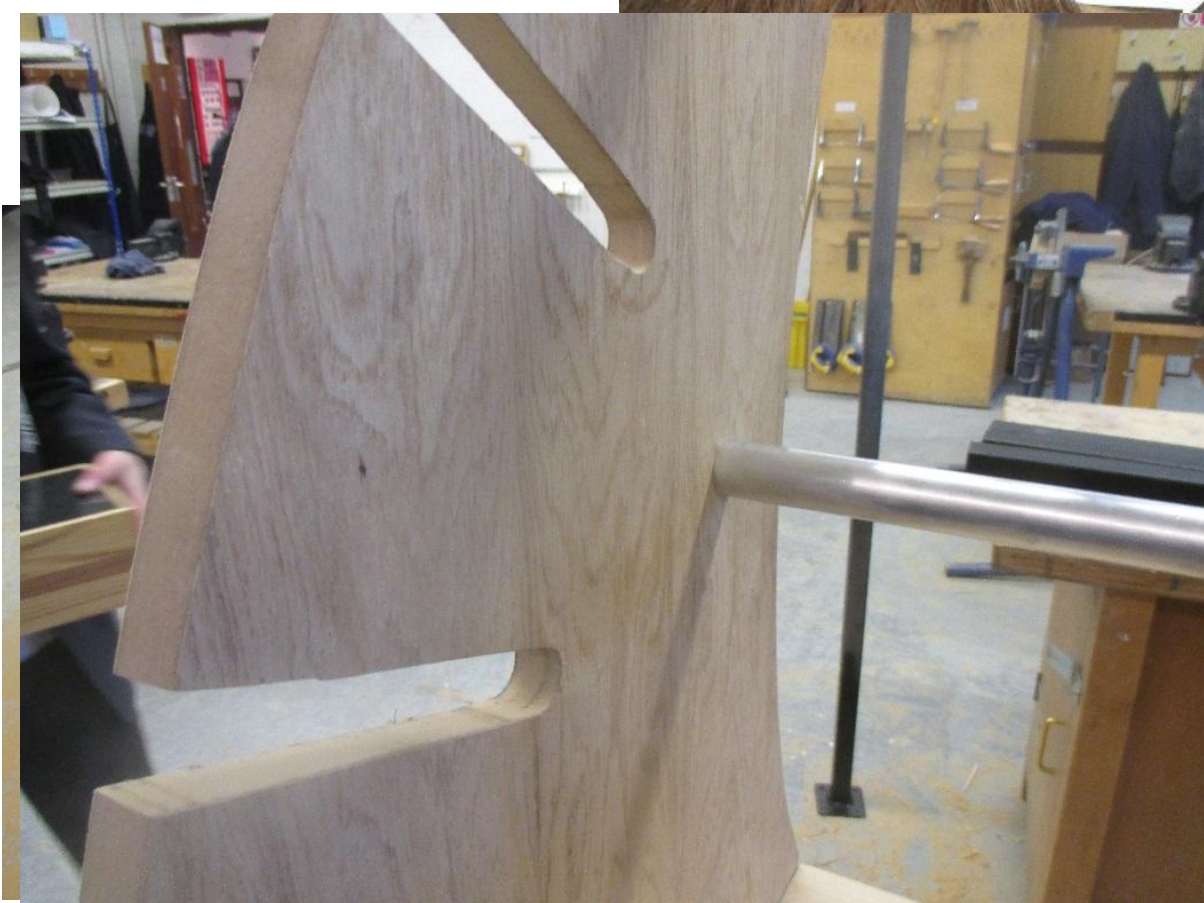
Mr. Long showed me a technique to make the walnut really pop. He told me to sand with various different grits of sand paper and in between doing this rub walnut oil with a damp cloth into the wood. This will allow the wood to be finished with a nice finish before I apply the final finish.

**Conclusion:**  
From this project I have identified that for my final design I will use bees wax to finish the front panel of my speakers and is will use a miter cut joint for the main enclosure. This will provide a good finish for the walnut front panel and will also provide a strong structure for the enclosure.

This is spirit sanding sealer  
This is bees wax  
This is clear Varnish  
Finishing Oil  
No Finish



Students must take photographs of their work as it progresses





# Students must record manufacturing progress as a diary, with annotated photographs showing the 'journey' they have been on.

## Realising Design:

**Health and Safety:** I had to watch the CNC router cut all the panels out to ensure everything was safe and it made no mistakes. Whilst doing this I wore eye protection to protect my eyes from fragments of MDF that could fly up. I also wore Ear defenders as the CNC router was very loud and could damage my ears. Whilst sanding I wore a dust mask to stop me inhaling all the dust from the filler.



I cut my final design out using the CNC router with a 6mm bit. This gave me an even consistent pattern which would be impossible to make by hand.



After all the parts had been cut on the CNC router. I used a file and some 180grit sandpaper to finish the edges and get rid of excess material.



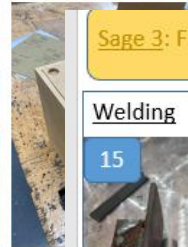
After all the parts had been filed and sanded, I placed them in groups so that I could identify which panels I need to glue together in order to get the pattern.



After all the parts had been placed into groups, I then glued them in groups of 3 at a time. This ensured that there was no panels that were inaccurately placed.



I then started placing a 6mm dowel through all the holes, so all the panels line up. I then hammered all the panels and placed glue in between the panels of 3.



After some 15 sand the enclosure belt sand the edge

### Sage 3: Finishing the interior on the shooting target

#### Welding



This shows how I welded the 75mm long tubes to the target shafts by slowly moving the welder over the joint. This set up that I made allowed me to weld the shaft at the right height and length of the tube.  
**Safety:** This shows that I am wearing gloves to protect my hands from hot sparks and the welding helmet protects my eyes from ultraviolet light and hot sparks, while letting me see what I am doing.

### Photographic diary of each stage of the shooting target build



#### Angle grinding

This shows me angle grinding the join of the shaft, tube and the circular target. To make a cleaner and smoother finish. I am using a clamp to stop the target from moving.  
**Safety:** Goggles storm the fragments of metal and sparks from going into my eyes.



After sanding the edges. I used a file to file the inside of the enclosure to create a slot so the crossover would fit in tightly. This will mean that it fits snug and with be a tight fit.



After sanding the edges flush, I used some filler and hardener and applied it to the top and back of the enclosure. I tried to make the coat as even as possible.



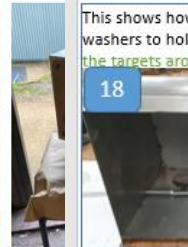
I then used a very coarse sanding paper, 180-grit and lightly sanded the top and back with a sanding block until the enclosure was no longer bumpy.



I then worked my way up the grits to get an even smooth finish I used 180-300-400-800-1200 and this allowed me to get a very smooth finish.



After sanding the enclosure smooth. I used a grey primer and layered the paint up I had to let it dry in-between coat and make sure there was no drippage.

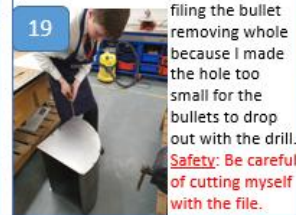


In between driving I sandpaper remove also had to spray does no

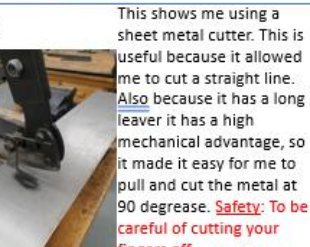
This shows how the targets will sit in the shooting target I am using nuts and washers to hold the targets in place. This also means that my users can move the targets around to what they want.



#### Filing



This shows me filing the bullet removing whole because I made the hole too small for the bullets to drop out with the drill.  
**Safety:** Be careful of cutting myself with the file.

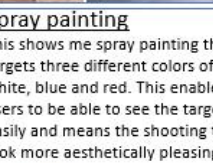


#### Metal sheet cutter

This shows me using a sheet metal cutter. This is useful because it allowed me to cut a straight line. Also because it has a long lever it has a high mechanical advantage, so it made it easy for me to pull and cut the metal at 90 degrees. **Safety:** To be careful of cutting your fingers off.

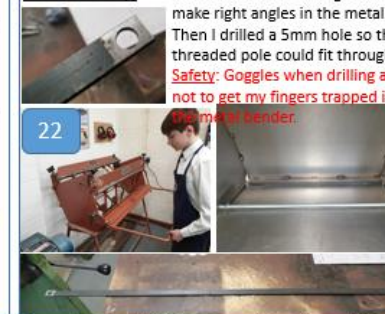
#### Spray painting

This shows me spray painting the targets three different colors of white, blue and red. This enables my users to be able to see the targets easily and means the shooting target look more aesthetically pleasing.



I used masking tape to make cover the areas of the targets that I didn't want to paint and to make a better finish. **Safety:** To wear goggles and a face mask so none of the particles go into my eyes and mouth.

#### Metal bending and drilling



This shows me using the metal bender by putting the target re-setter in and then lifting handle to make right angles in the metal. Then I drilled a 5mm hole so the threaded pole could fit through.  
**Safety:** Goggles when drilling and not to get my fingers trapped in the metal bender.

### My finished interior of the shooting target

This shows the mechanism of the target. This would work by the lever on the left being pulled by a rope, then the re-setting arm would pull the targets to their original position.



Name: Tom. Slater

Candidate No: 2101

Seaford College: 65159

Kristian Fairston

Candidate Number: 2031

Seaford College Centre Number: 64159

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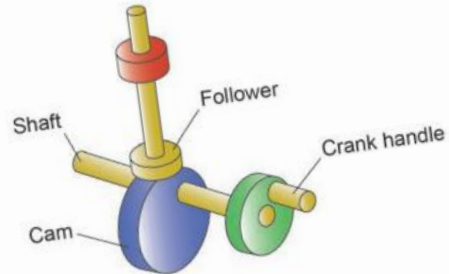
# Examination 50%

Examination includes a range of questions that ramp up in complexity to include multiple choice, designing and discussion type questions.

0 8

What change in motion takes place in the mechanism in **Figure 1** when the crank handle is turned?

**Figure 1**



- A Linear to reciprocating
- B Oscillating to rotary
- C Reciprocating to linear
- D Rotary to reciprocating

2 1

Study the picture in **Figure 3** and the specification below.

**Figure 3**



### Specification for playground equipment

- For use by children age 4-12.
- Designed for external use.
- Recessed/flush fitting construction.
- All fittings are tamper proof.
- Use of weatherproof materials.
- Suitable for installation on a flat surface.
- Use of non-slip surfaces.
- Tough, durable and wear resistant finish.
- Parts designed to be bolted together.

2 1 . 1

Analyse and evaluate the playground equipment

2 2

The step ladder in **Figure 4** has 12 steps. Each step is 275 mm long, 100 mm wide and 25 mm thick.

**Figure 4**



2 2 . 1

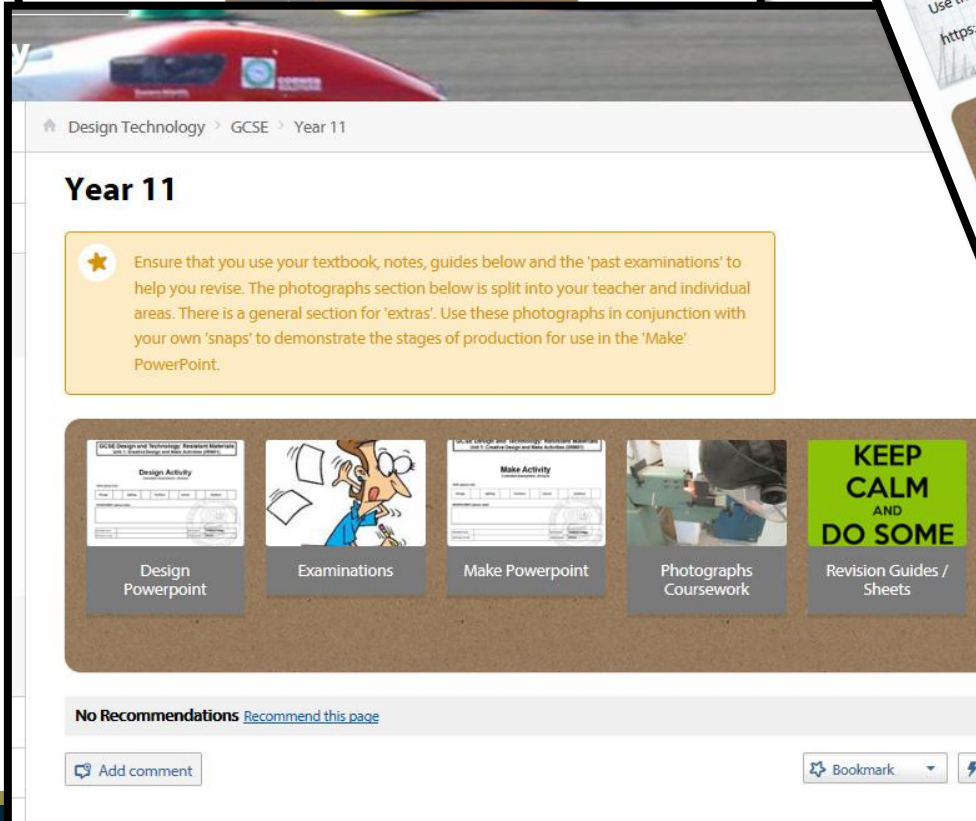
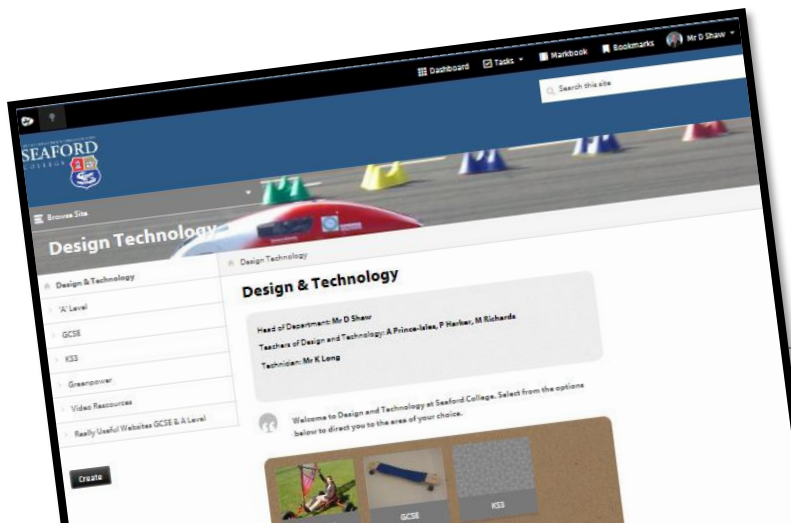
Each step should be 275 mm long.

The manufacturing tolerance is  $\pm 0.5\%$

Calculate the maximum and minimum length of each step to two decimal places.

[2 marks]





- Students and parents have access to revision and key coursework documents using the Firefly platform
- Preps and deadlines will also be listed on the site







# Future pathways

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D&T opens up a variety of careers in areas such as:-

Engineering

Product Design

Building and Construction

Architecture

Interior Design

(To name a few.....)

# Any questions?

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If you have any questions regarding the content of the course please contact me using  
[dshaw@seaford.org](mailto:dshaw@seaford.org)