

# **Toynbee Curriculum**

## **KS3 Knowledge Maps**

# **DESIGN AND TECHNOLOGY**

**Toynbee School**



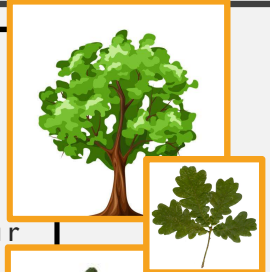
# YEAR 7 – MECHANICAL TOY

**Marking Out Equipment:**  
**Ruler/Steel rule** - for measuring and drawing straight lines  
**Pencil**—For marking onto wood/paper/card  
**Try Square**—For marking a line at right angles to an edge  
**Marking out in Technology is done in mm at all times**



**Hardwood**

- Slow growing
- Loses leaves
- Deciduous trees
- heavy, distinctive grain
- Generally darker colour
- More dense/harder



**Softwood**

- Fast growing
- Evergreen
- Less pronounced grain
- Less dense



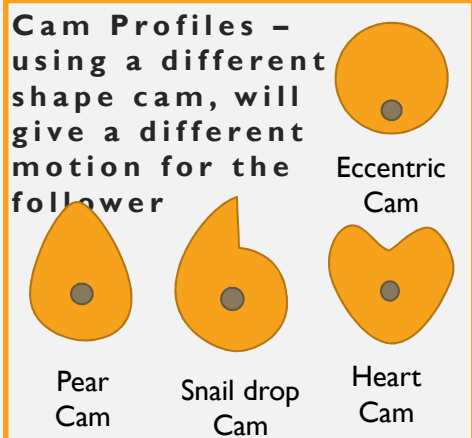
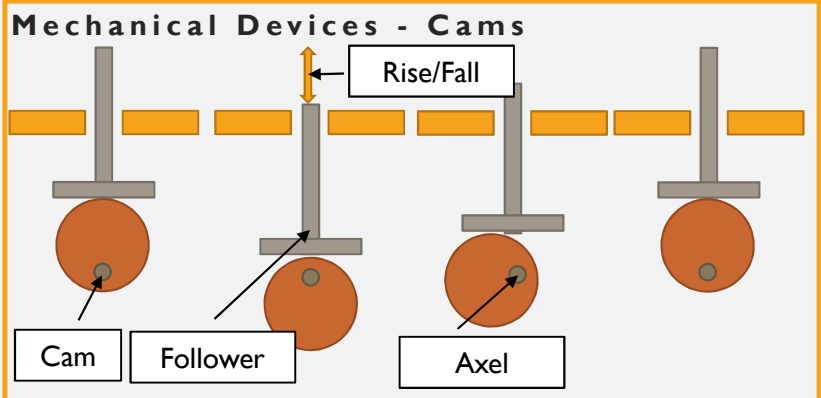
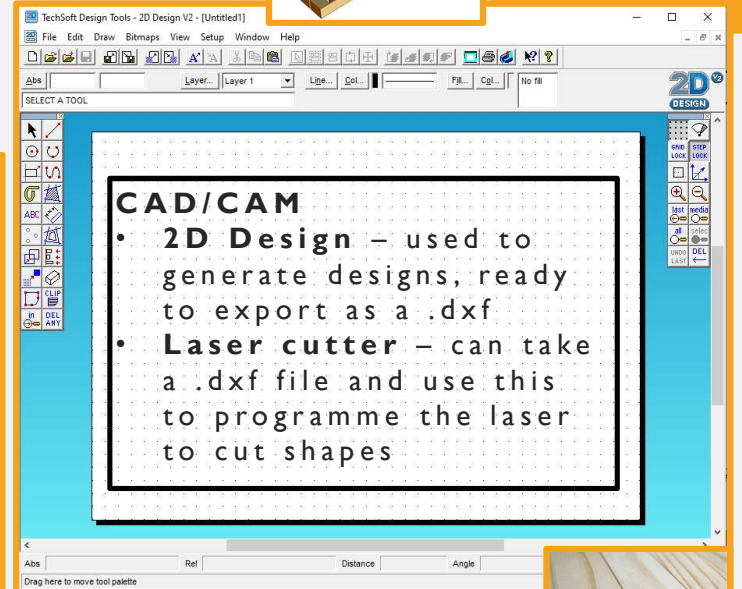
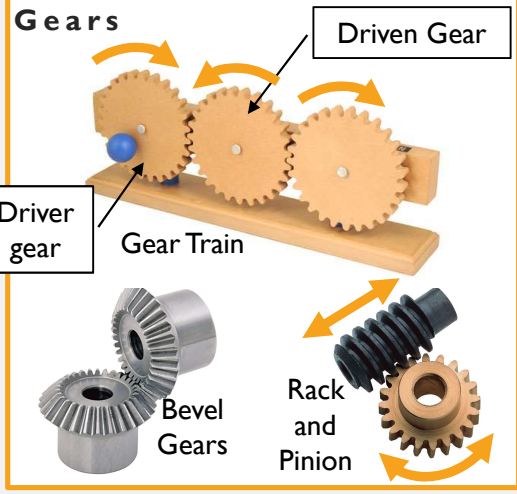
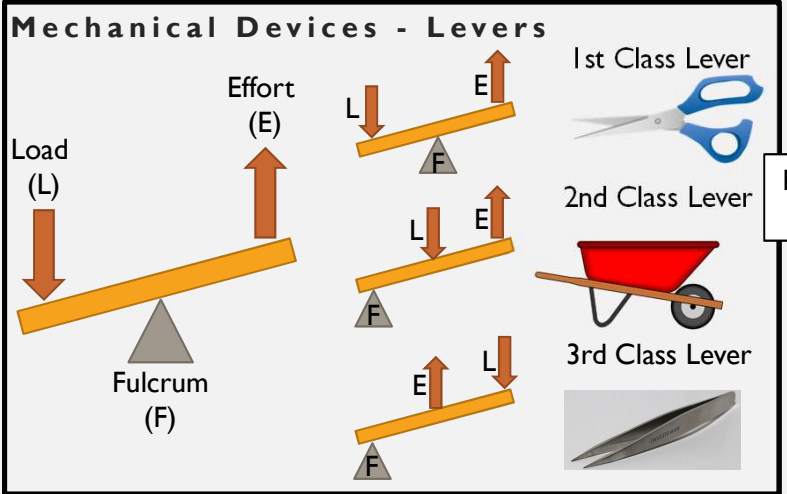
**Structures**  
 Can be made stronger/more rigid by:

- Making them “bottom heavy”
- Use triangles
- Use brick patterns



**General Health and Safety in the Workshop**

- Hair tied up
- Goggles on
- No running
- Carry tools safely
- Follow instructions



**Materials—Wood based**  
**Pine**—Softwood, fast growing attractive grain, relatively cheap  
**MDF**—Made from waste product of saw mills, very strong, comes in a range of thicknesses  
**Plywood**—made from thin “ply’s” which are laminated at 90° to each other  
**Dowel** – round thin lengths of timber (often hardwood)



# YEAR 7 – TINY HOUSE

**Design specifications -**  
Used for: describing all the features/relevant information the designer must consider when designing a product or service  
Structure: often uses the ACCESSFM acronym to structure

**User-centred design –** focuses upon the needs and wants of a specific user or group

## Scales of manufacturing

**Bespoke / One off**

**Batch**

**Mass**

**Continuous**

Jewellery, musical instruments, housing

Flat pack furniture, baked products, clothing

Mobile phones, packaged food and drink


Paper, peanut butter, oil (refining)

- A** is for **Aesthetics**
- C** is for **Cost**
- C** is for **Customer**
- E** is for **Environment**
- S** is for **Size**
- S** is for **Safety**
- F** is for **Function**
- M** is for **Material**


How do designers gather information and data?

**Techniques**


Questionnaire/ Survey




User interview



Product Trials



Existing Product analysis



What are paper based materials?


Paper based materials are normally thin sheet materials made from the pulp of trees (cellulose)

- Corrugated Card
- Copier Paper
- Foam Core
- Tracing Paper
- Grey board
- Carton board

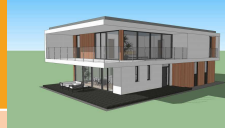
How do designers trial their ideas?

**Modelling**


Card Modelling



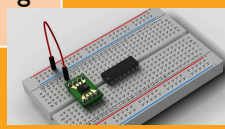
CAD Modelling



Block Modelling



Breadboard modelling (electronics)



## WHAT IS SUSTAINABILITY?

Sustainability is a societal goal that broadly aims for humans to safely co-exist on planet Earth over a long time.

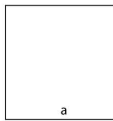


How can housing be made more sustainable?




How do designers calculate the cost of finishes?

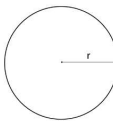
Cost = area x cost of finish  
E.g. Living room floor x cost of wood planks  
 $3m^2 \times £25/m^2 = £75$



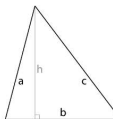
**Square**  
 $A = a^2$



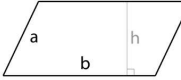
**Rectangle**  
 $A = l \times w$



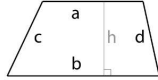
**Circle**  
 $A = \pi r^2$



**Triangle**  
 $A = 1/2bh$



**Parallelogram**  
 $A = b \times h$



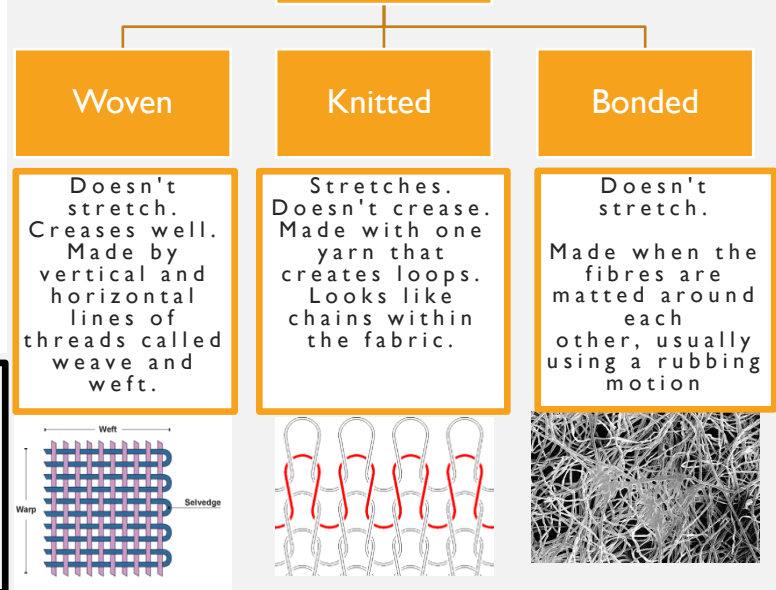
**Trapezoid**  
 $A = 1/2(a + b)h$

# YEAR 8 – SMART/MODERN TEXTILES WEARABLE

- A** is for **Aesthetics**
- C** is for **Cost**
- C** is for **Customer**
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- S** is for **Safety**
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## Types of Fabric Construction



## Smart and Modern Materials

**Thermochromic**  
Changes colour with heat

**Photochromic**  
React to UV light and change colour

**Reflective Fabrics**  
Use glass beads with refract light and make the light reflect back to the source

**Pressure Response Fabric**  
Soft and bendy material that hardens on impact

**Solvation Chromism**  
Reacts to moisture, changing colour

**Time Response**  
Over time these fabrics change colour or dissolve.

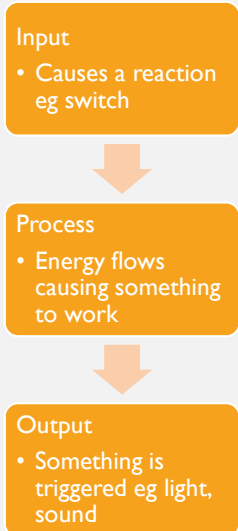


- Sewing Safety!**
- Hair up
  - No talking whilst sewing
  - No trip hazards
  - Machine turned off when threading up
  - Have work prepped

Natural Fabrics	Synthetic (Manmade) Fabrics
<b>Cotton</b> From cotton plant. Grown in hot climates.	<b>Kevlar</b> Lightweight, heat resistant, durable, used for bullet proof vests
<b>Silk</b> From silk worm or silk spider – the cocoon they are wrapped in is silk fibres	<b>Nylon</b> Substitute for silk – started as parachutes in WW2
<b>Denim</b> Cotton used in a strong weave pattern	<b>Elastane</b> Incredible stretchy
<b>Wool</b> From sheep/goat, spun and often knitted	<b>Polyester Fleece</b> Derives from petrolium (plastics)
<b>Leather</b> Skin of animals, usually cow	<b>Gore Tex</b> Breathable and waterproof
<b>Felt</b> Wool matted together	<b>When materials are combined to make a new fabric with improved qualities, this is called a COMPOSITE MATERIAL</b>

# YEAR 8 – USB MOOD LIGHT

Component	Photos	Symbols
Switch		
Battery		
LED		
Resistor		



### Plastics

**Thermosetting** – Plastics can not be reheated and reshaped due to chemical reaction that occurs

- Initially set by heat
- Can not be reshaped once set
- Extremely strong and durable
- Can not be recycled

**Thermoforming** – can be reheated and therefore can be reshaped

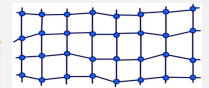
- Soften when heated
- Can be reshaped
- More commonly used in school
- Can be recycled

### Epoxy Resin

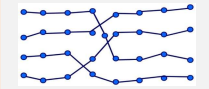
- Properties – good electrical conductor, durable and brittle
- Uses – Adhesives, castings and circuit boards

### Polyester resin (PR)

- Properties – Hard, brittle and heat resistant, good electrical conductor
- Uses – Electrical fittings and door handles



**Thermoset**



**Thermoform**

### Acrylic

- Hard, shiny but scratches easily
- Baths and signage

### High impact Polystyrene (HIPS)

- Properties – Hard, ridged, lightweight
- Food pots and casing

### Polypropylene

- Properties – Tough, Lightweight, flexible
- Uses – Stationary, food packaging and rope

Property	Meaning
Hardness	Ability to resist wear, scratching and indentation
Elasticity	Ability to bend and then return to its original position
Insulator	Ability to prevent heat or electricity from passing through
toughness	Ability to withstand blows or sudden shocks
Tensile strength	Ability to withstand a force without breaking or bending

### Resistance

Resistance is the hindrance to the flow of electrons in material. The shorter the length of material, the lower its overall resistance.

**Polarity** - The electrical energy will only pass in one direction



**Microcontroller**  
A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system.

### Soldering – guide to good/bad joints

### How to Solder

### Non Renewable Energy

- Coal
- Oil
- Gas
- Nuclear

### Renewable Energy

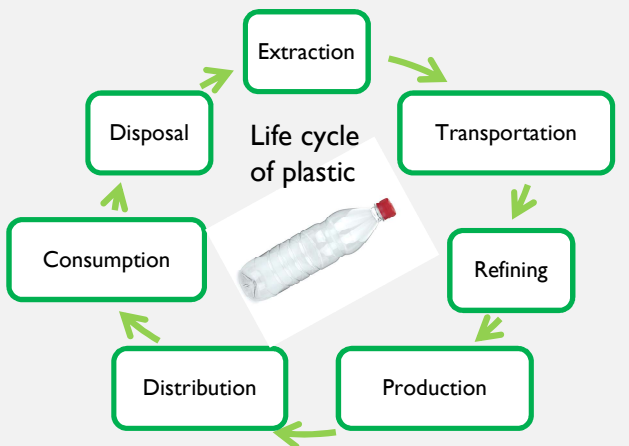
- Wind
- Wave
- Solar
- Tidal
- Biomass
- Geothermal

### Tools and Equipment

**Coping Saw**—Used to remove intricate or shaped pieces of wood/MDF/plywood

**Tenon Saw**— Flat deep saw, used for making straight cuts, useful in making wood joints

**Wood files**—Used to remove very small amounts of material, come in a variety of shapes/sizes

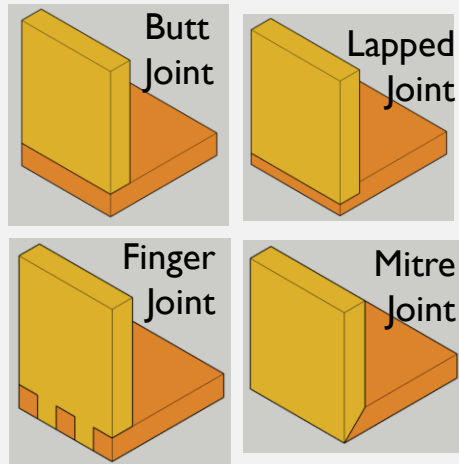


# YEAR 9 – LAMINATED TIMBER CLOCK BOX

## Stock forms for timber based materials



## Basic Wood Joints



Type of (standard) Component	Description and Use
Nails	Made from Mild Steel Mostly used where appearance isn't important
Panel and Veneer Pins	Made from Mild Steel Used to fix backs into cupboards Veneer pins are finer and thinner
Wood screws	They are used to join metal or plastic components to wood, or to join two pieces of wood to make a strong joint
(Nuts & Bolts)	They have a screw thread which fits into a threaded hole or a hexagonal nut, and are normally used to join two or more pieces of metal or plastic A bolt is only threaded for part of its length Bolts normally have hexagonal heads
Hinges and catches	They are used on boxes, cabinets and cupboards They can be used on products made from wood, metal or plastic They are normally fixed to the product with wood screws or machine screws and nuts

## Scales of Production

One-off production - single custom made product/prototype



Batch Production - set number quantity of products



Mass production - large volume of identical products



Continuous production - high volume produced 24/7



## Process: Hand polishing Acrylic

Cross Filing

Draw filing

Sanding with gradually finer grit wet and dry (600, 800, 1200)

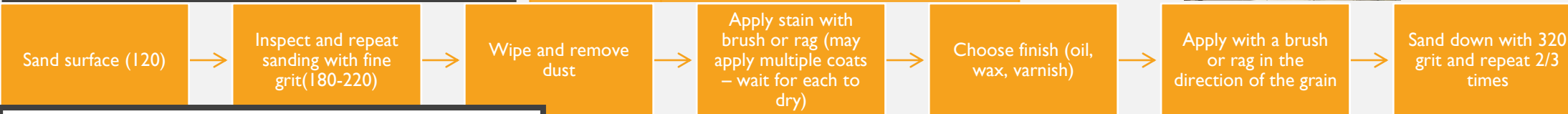
Sand with finest grit wet and dry – use wet

Use a polishing compound (Brasso is used in school)

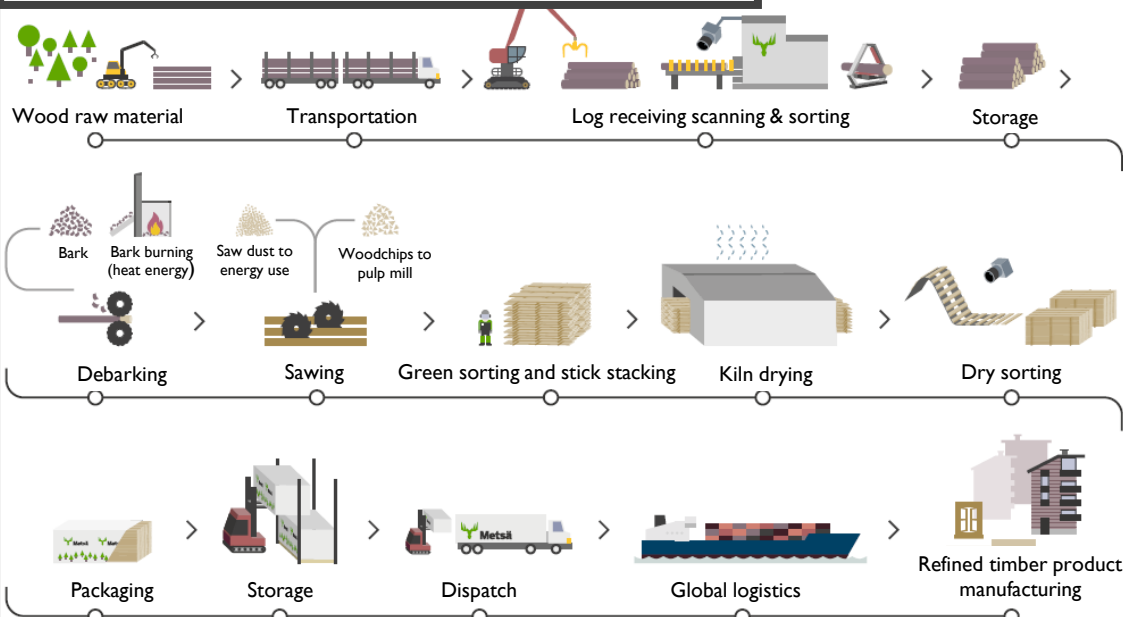
## Process: Laminating timber



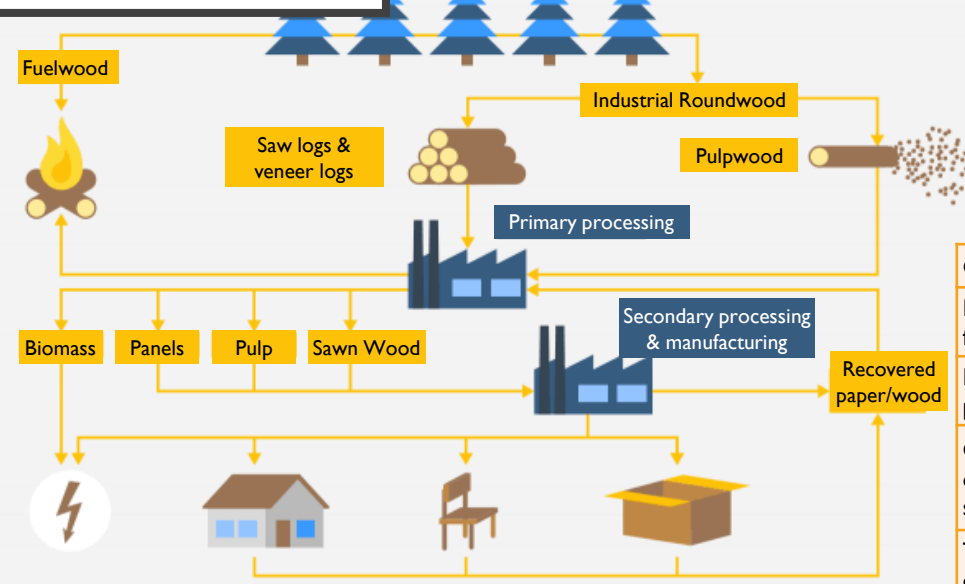
## Process: Staining and finishing timber based materials



## Sawn Timber Manufacturing Process



## Life cycle of timber



Quality control	Quality assurance
Focuses on identifying faulty goods	Focuses on improving the production process
Identifies and fixes problems and faults	Establishes a good system for quality management
Quality is the responsibility of one individual or a specific team of individuals	Quality is the responsibility of everyone involved in the manufacturing process
The product is at the heart of quality control	The production process is at the heart of quality assurance