Year 9 STEM Knowledge Organiser
Yacht Design

Energy Transfers:
Heating Energy is transferred to cooler surroundings by heating.
Gravitational Any objects in high positions are storing energy.
Electricity Electric currents transfer energy from one place to another.
Light Light carries energy from the sun and from artificial sources too.
Kinetic We call energy stored in moving things kinetic energy.
Thermal All warm objects are energy stores.
Chemical Energy is stored in the bonds between particles, which we find in batteries, for example.
Elastic Energy is stored in squashed or stretched materials.
Sound Anything making a noise demonstrates sound carrying energy from one store to another.

Averages and Range:
Mean add up all of the values to find a total. Then divide the total by the number of values you added together.
Mode is the most frequent value. Count how often each value appears. See which appears the most – that's the mode.
Median is the middle value, but remember to put all the values in order first. If there are two values in the middle, work out which value is halfway between them.
Range is the difference between the lowest and the highest values. Subtract the lowest value from the highest to work out the range.

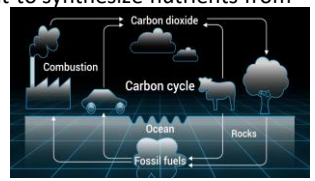
Iterative design process:
Primary user The person, or group of people, who will be using your product.
Stakeholder Any individuals, groups or organisations with an interest in your product, for example, the team sponsor when designing new crew clothing.
SCAMPER- Substitute, **C**ombine, **A**dapt, **M**odify, **P**ut to another use, **E**liminate, **R**earrange

Materials
Carbon fibre is threadlike strands of pure carbon that are incredibly strong and flexible. It is lightweight and stronger than steel.
Gore-Tex® is a synthetic fabric which is permeable to air but not to water. This means it is breathable but waterproof. This makes it an ideal fabric for outdoor and sports clothing
Synthetic fleece can be made from polyester and is extremely warm. It is more lightweight than natural wool fleece, and it dries quicker.
Nylon is a tough, lightweight, elastic synthetic polymer. It is warm to wear, absorbent, dries quickly and is durable.
Stainless steel is a steel alloy which contains chromium, making it resistant to tarnishing and rust. It is very strong and stiff.
Neoprene is a synthetic polymer resembling rubber. It is water resistant, elastic, and a good insulator.
Aluminium is a metal with a low density. This means that it is lightweight for its size. It has a very thin layer of oxides on the surface, which stops air and water getting to the metal so it can resist corrosion.
Expanded polystyrene (EPS) is a rigid and tough, closed-cell foam. It is usually white and made of pre-expanded polystyrene beads. It is very lightweight.
Dyneema fibres are mainly used in ropes, and are lightweight and high strength. It's resistance to water means that it is often used in sailing.

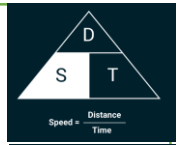
Finishes:
Protects the surface of a product to prevent decay.
Varnish enhances the look, brings out the grain, provides a shiny finish, it makes it water resistant, smoother finish and protects.
Applying cleaning with an abrasive paper (glass paper), cleaning (washing/wiping), apply a first coat, creating a key in between coats with wet and dry paper, wait for the varnish to dry in between coats and apply 3 coats.

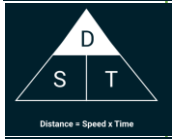
Tools:
Try Square used to check and mark right angles.
Plane shaping wood by hand
Disc Sander a machine with a circular face of abrasive

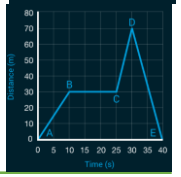
Carbon cycle:
The series of processes by which carbon compounds are interconverted in the environment, involving adding carbon dioxide into living tissue by photosynthesis and its return to the atmosphere through respiration, the decay of dead organisms, and the burning of fossil fuels.
Fossil fuels a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.
Respiration a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide from the oxidation of complex organic substances.
Decay (of organic matter) rot or decompose through the action of bacteria and fungi
Photosynthesis the process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water.



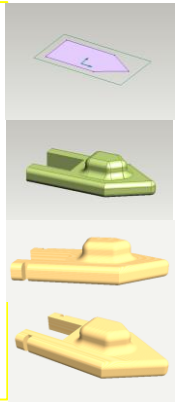
Speed, distance and time:
Speed is all about the relationship between distance travelled and time taken.
Speed
To work out the speed of an object, take the distance it has travelled and divide this by the time it has taken to travel.
Distance
To work out the distance which an object has travelled, take the speed at which it is travelling and multiply this by the time it has taken to travel.
Time
To work out how long an object has taken to travel, take the distance it has travelled and divide this by its speed.
Distance-time graphs
We can use distance-time graphs to represent the journey of an object from its starting point.







CAD in Design and Manufacture:
The advantages of using CAD:
- This is used to speed up the process and can create 2D, 3D drawings that can be rendered and to scale.
- These designs can then be sent to a rapid prototype machine, that can print out the design to be a 3D model.
- See and manipulate designs in the 3d environment.
- This helps the client to imagine what their design will look like.
- Use of computer to test components before manufacture.
- Designs can be sent abroad for clients to view.



Key words:

Iterative design
Design context
Design brief
Concept map
Primary user
Stakeholder
Gravitational
Hydrofoils
Potential energy
Kinetic
Thermal
Substitute
Combine
Adapt
Modify
Put to another use
Eliminate
Rearrange
Carbon Cycle
Emissions
Combustion
Fossil fuels
Respiration
Decay
Photosynthesis
Models
Prototypes
CAD
Virtual testing
Pro desk top
Google Sketch up
Try square
Metal ruler
Pine
Coping saw
Fret saw
Abrasive paper
Plane
Disc sander
Extraction unit
PPE
Square file
Varnish
Key
Grainline