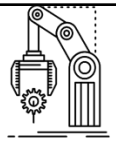
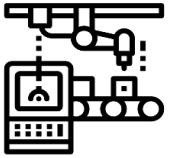
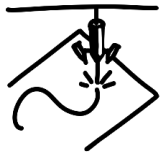
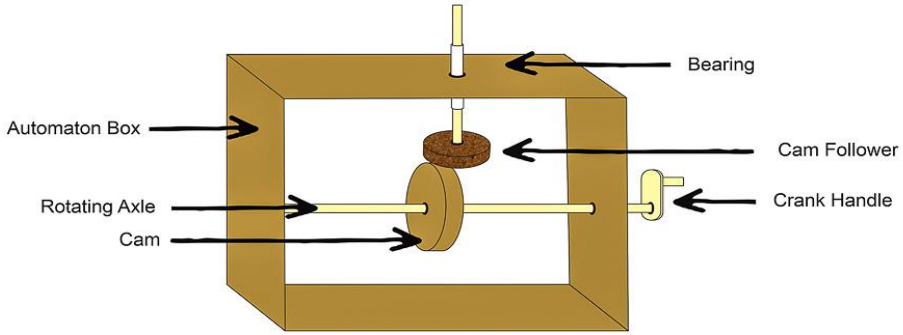
Design and Technology Knowledge Organiser | Y9

Key word	Definition	Picture code
Automation	Using computer technology to operate equipment.	
CAD	Computer aided design: using computer software to draw, model and simulate the performance of a product.	
CAM	Computer aided manufacturing: using computer software to control machine tools to make products.	
Laser	A powerful, narrow beam of light that can be used to cut metal and other materials.	
Engrave	To cut or carve words, pictures or patterns onto the surface of hard materials such as metal or stone.	
Cam and Follower	Mechanisms that turn rotary motion into reciprocating motion.	
Automata	A mechanical devices that can be self-operating and follow a predetermined sequence of actions.	

What is an automata?

Cam toys (aka automata) use hand-powered mechanisms to create cyclical motions that animate a scene. Students design and create cam toy machines with moving objects/characters that symbolize abstract concepts and represent dynamic situations.

THE PARTS OF AN AUTOMATON



Types of Movement

Linear

This is a linear form of motion because the needle will move only up and down

Reciprocation

This is a reciprocation form of motion because the fan can move spin both ways

Rotary

This is a rotary form of motion because the bike wheel will rotate one way

Oscillating

This is an oscillating form of motion because the swing will swing back and forth

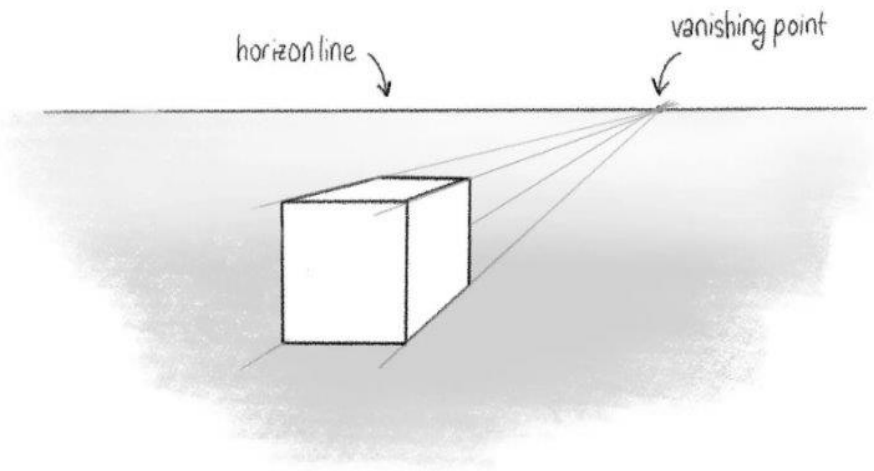
Eccentric
Also called and offset cam) produces a uniform motion

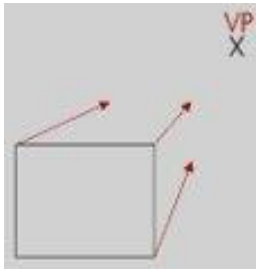
Pear
Remains stationary for half a turn then gently rises and falls

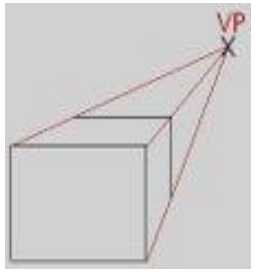
Snail
is used where the drop or fall of the follower must be sudden.

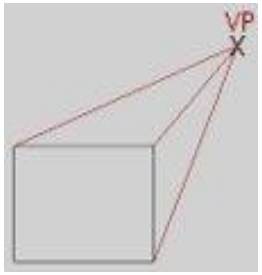
Heart
produces a steady rise and fall motion and uniform velocity.

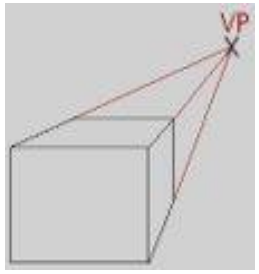
One point perspective



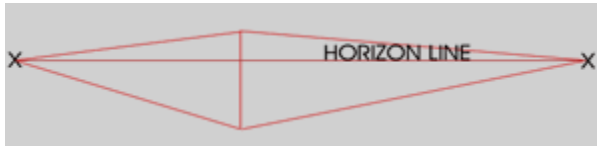


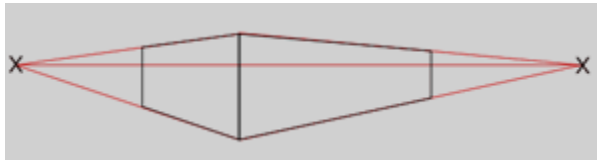


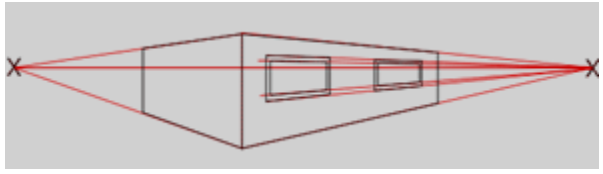


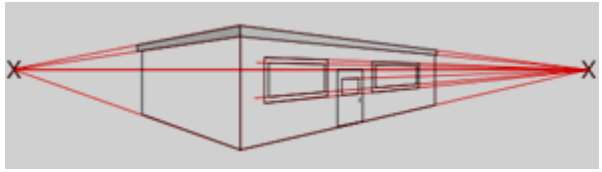


What is perspective?
Perspective is a technique applied in drawing to give a flat image a sense of depth





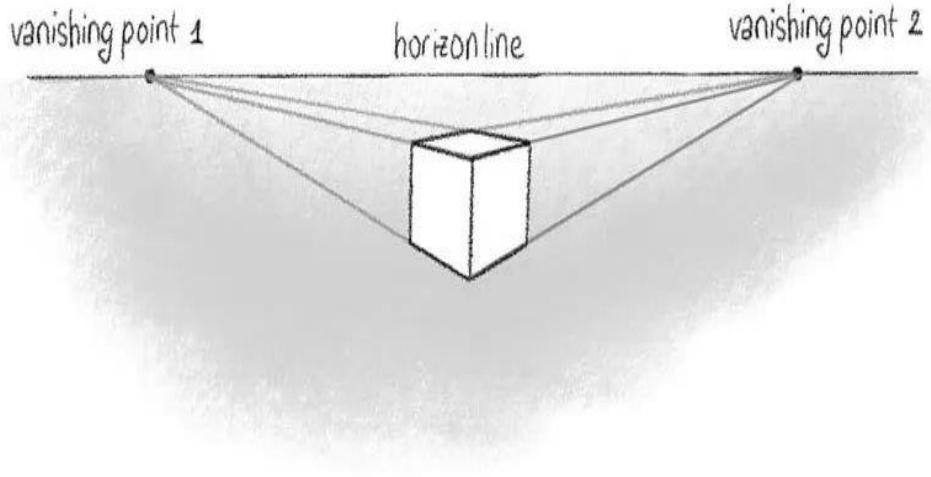




Two point perspective

Vanishing Point (VP)
The vanishing point is where all parallel lines intersect and is always on the horizon line.

Horizon line
The horizon line is where the sky meets the land and the water underneath.



We use **ACCESS FM** to help us write a **specification** - a list of requirements for a design - and to help us **analyse and describe** an already existing product.

ACCESS FM - Helpsheet

A is for **Aesthetics**

Aesthetics means **what does the product look like?**
What is the: Colour? Shape? Texture? Pattern? Appearance? Feel? Weight? Style?

C is for **Cost**

Cost means **how much does the product cost to buy?**
How much does it: Cost to buy? Cost to make?
How much do the different materials cost? Is it good value?

C is for **Customer**

Customer means **who will buy or use your product?**
Who will buy your product? Who will use your product?
What is their: Age? Gender?
What are their: Likes? Dislikes? Needs? Preferences?

E is for **Environment**

Environment means **will the product affect the environment?**
Is the product: Recyclable? Reuseable? Repairable? Sustainable? Environmentally friendly? Bad for the environment?
6R's of Design: Recycle / Reuse / Repair / Rethink / Reduce / Refuse

S is for **Size**

Size means **how big or small is the product?**
What is the size of the product in millimeters (mm)? Is this the same size as similar products? Is it comfortable to use? Does it fit? Would it be improved if it was bigger or smaller?

S is for **Safety**

Safety means **how safe is the product when it is used?**
Will it be safe for the customer to use? Could they hurt themselves? What's the correct and safest way to use the product? What are the risks?

F is for **Function**

Function means **how does the product work?**
What is the products job and role? What is it needed for? How well does it work? How could it be improved? Why is it used this way?

M is for **Material**

Material means **what is the product made out of?**
What materials is the product made from? Why were these materials used? Would a different material be better? How was the product made? What manufacturing techniques were used?

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CAD

Computer-aided design (CAD) is the use of computer software to draw, simulate and model the performance of products.

Compared to drawing products by hand, the **advantages** of CAD include the following:

- When a mistake is made or a design is changed, a CAD drawing can be edited. If drawing by hand a completely new drawing would have to be made, which would take more time.
- CAD is normally more accurate than drawing by hand.
- Designs can be shared electronically between designers.
- 3D CAD models can be viewed from different angles and rendered to look like the final product.
- Designs can be tested on screen to see how well they work. This saves money and time making physical prototypes.
- Designs can be sent directly to computer-controlled equipment to be made.

Disadvantages of CAD:

- The software can be expensive to buy and training may be needed to use it.
- Can have a high set-up cost.
- There can be security issues as com can store lots of other information.

CAM Equipment

Heat Press

A heat press uses heat and pressure for a pre-set period of time to print a design on to a material

CNC Milling Machine

A CNC milling machine has a cutting tool that can be used to engrave away the unwanted areas of the material to create the design.

Laser cutter

Laser cutting is a process that uses a thin, focused, laser beam to cut and etch materials such as wood, plastic, metal into custom designs, patterns, and shapes as specified by a designer.

3D Printer

3D printing is the construction of a three-dimensional object from a CAD.

Embroidery Machine

The **embroidery machine** used only for artistic embroidery and is not designed for other sewing jobs.

Laser Cutter

SCAN ME

CNC Milling Machine

SCAN ME

CAM

Computer-aided manufacturing (CAM) is the use of computer software to control machine tools to make products. Based on a CAD drawing, software tells a machine tools what path to follow and when to cut. For example a laser cutter could be used to cut gear shapes from a sheet of acrylic.

Compared to making products on machines controlled by humans, the **advantages** of CAM include the following:

- Computer controlled machines can usually carry out manufacturing operations faster.
- Complicated shapes can be more easily produced.
- When making parts in large quantities, every product manufactured is exactly the same with high levels of accuracy.
- Machines can run 24 hours a day, 7 days a week.
- CAM can also have disadvantages, however. These include:
- Similar to CAD, there can be a high initial set-up cost.
- CAM machines are usually very expensive, although they are becoming cheaper as our ability to make them improves.
- For one-off products, CAM may take more time than making the product by hand due to the needs to programme the machines.