SUBJECT LEADERSHIP 3

Design & Technology in Primary Schools

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Date: Thursday 26th June 2025

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Welcome and Training Overview

OVERVIEW

Welcome & Introductions

Part A: Quality Assuring the Curriculum

Section 1: Knowledge, Progression and Assessment

Section 2: Recording Children's Learning

Section 3: Evidencing the quality of the curriculum – working smart.

Part B: Subject Knowledge: Systems

Section 1: Introduction to Systems

Section 2: Mechanical Systems

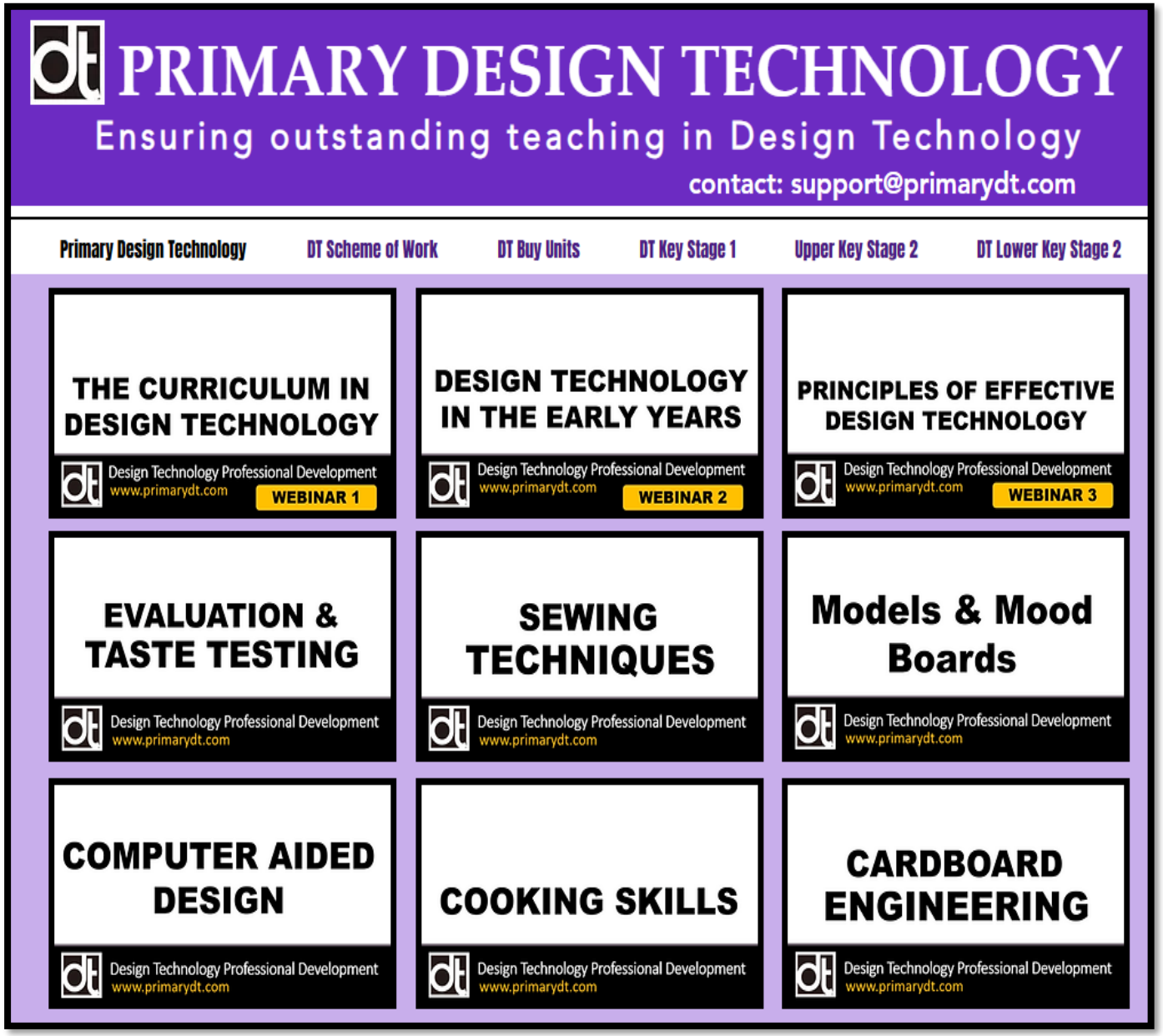
Section 3: Electrical Systems

Section 4: Program Systems

Practical Workshop: RoboWars!

OBJECTIVES

- To understand the importance of delivering a knowledge-based curriculum in design technology and how this impacts on securing progression.
- To demonstrate how an effective progression document can be used to develop an assessment strategy for design technology.
- To examine why we record children's learning in design technology.
- To begin to develop ways of quality assuring the curriculum and learning in design technology.
- To understand the systems strands of learning in design technology and how they are incorporated into designing and making quality products.
- To make a controllable vehicle and win the RoboWars!



www.primarydt.com/ealing

Thursday 14th November 2024

Self-Evaluation & Action Planning

Schools to bring curriculum documents/long-term planning. Audit will cover:

- National Curriculum Requirements
- Design Technology strands of learning
- Fundamentals and Principles of DT
- Long term planning to ensure progression and knowledge-building
- Key Document – Progression of knowledge and skills
- Key Document – Progression and teaching vocabulary

Subject Knowledge Session: Cooking and Nutrition

- The curriculum in Cooking and Nutrition
- Essential knowledge (disciplinary and substantive knowledge)
- Additional learning opportunities (food origins, seasonality, different diets)
- Progression of cooking skills
- Enterprise activities when cooking.
- Resources for cooking and nutrition.

Downloadable Resources

Course notes (Curriculum)
Course notes (Cooking and Nutrition)
Design Technology Audit (Curriculum)
Design Technology Audit (Cooking and Nutrition)

Apple Taste Test Evaluation Sheet
Generic Intent Implementation and Impact Statement
Design Technology in the Early Years
Cooking Matters Guidance
Progression in Food Skills
Vocabulary List
Curriculum Pathway (Progression Document)

Thursday 6th February 2025

Teaching and Learning in Design Technology

- Principles of effective design technology
- Developing a Unit of Work in DT
- Technical knowledge and staff subject knowledge
- Three lesson types in DT

Subject Knowledge Session: Textiles

- The curriculum in textiles
- Essential knowledge (technical and practical knowledge)
- Textiles - Projects and Products
- Workshop - Teddy Textiles

Downloadable Resources

Course notes (Teaching & Learning)
Course notes (Textiles)

Presentation: Decorating Fabrics
Presentation: Embroidery
Presentation: Sewing Techniques

Teddy Waistcoat Pattern Template

Welcome and Training Overview

Part A: Quality Assuring the Curriculum

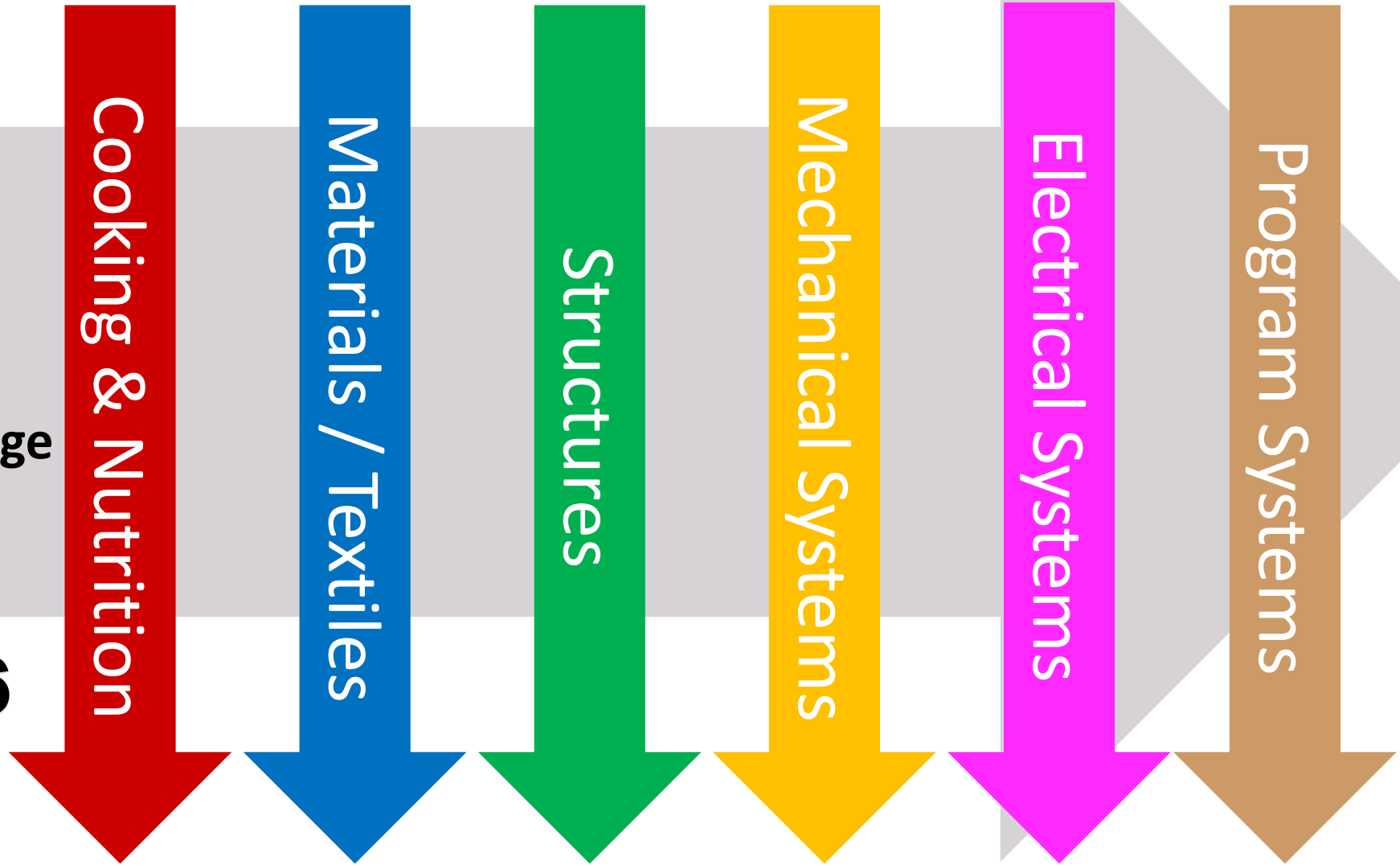
Knowledge, Progression & Assessment

DESIGN TECHNOLOGY CURRICULUM
KNOWLEDGE BUILDING

EYFS

Designing
Making
Evaluating
Technical Knowledge
Vocabulary
Designers

YEAR 6



KNOWLEDGE IS KEY

The national curriculum for design and technology aims to ensure that all pupils: *Build and apply a repertoire of knowledge, understanding and skills in order to design and make high-quality prototypes and products for a wide range of users.*

Skills = Practical Knowledge
Understanding = Connecting the knowledge together

CREATIVITY = KNOWLEDGE + IMAGINATION

As children progress through the curriculum, they build their knowledge
Learning = acquiring new knowledge, remembering it, connecting it

The principles of effective design technology are:

- Designing and making a product
- Understanding the iterative process
- Knowledge building
- Children making design decisions
- Working in relevant contexts

KNOWLEDGE BUILDING IN DT

Progression: getting better at....

EYFS

Y6

SUBJECT

- Topic
- Product
- General Knowledge
- Context
- Real Life/Relevant

TECHNICAL

- How things work
- How things are made
- Component parts
- Functions
- Systems

DISCIPLINARY

- How the subject works
- Iterative process
- Designing
- Making
- Evaluating

PRACTICAL

- Skills
- Techniques
- Cooking & Nutrition
- Materials
- Structures
- Mechanical Systems
- Electrical Systems
- Program Systems
- Keeping Safe

KNOWLEDGE BUILDING IN DT

Money Containers (Lower Key Stage 2)

Subject Knowledge

- What is a money container?
- Names of different money containers.
- History of money containers.
- What is its function?

Technical Knowledge

- Using a pattern template to create fabric pieces.
- Temporary and permanent joining together of fabric pieces.
- Different types of fastenings.
- Materials used to make money containers linked to their properties.
- Techniques for decorating fabrics.

Disciplinary Knowledge

- Investigating money containers – what makes a good money container.
- Trying out ideas by creating models and prototypes.
- Design briefs and design specifications.
- Link between designer, product and client.

Practical Knowledge

- Threading a needle
- Decorative stitching
- Overstitch technique to join fabric pieces.
- Creating pattern templates to make a textile product.

KNOWLEDGE BUILDING IN DT

Children getting better at....

TECHNICAL

Increasing knowledge of how things are made, how they work and their component parts

- Cooking and Nutrition (healthy eating, food origins and production, dietary choices, seasonality)
- Materials (different properties, joining and combining, strengthening materials, decorating and finishing)
- Structures (types of structures, techniques to make stronger, stiffer and more stable)
- Mechanical Systems (types of movement, key mechanical systems – wheels & axles, cams, levers & linkages, pneumatics)
- Electrical & Program Systems (systems used to control and monitor a product)

DISCIPLINARY

Understanding the iterative process (moving from taught to a mindset)

Designing

Sketching, different drawings, mind mapping, brainstorming, mood boards, designer-product-client relationship, design briefs and specifications

Making

Skills and techniques, getting organised, planning to make, rules and practices for health, safety and hygiene

Evaluating

Investigating and evaluating existing products and products that have been created. Identifying strengths and weaknesses, suggesting improvements, evaluating whilst working, evaluating the process and then project.

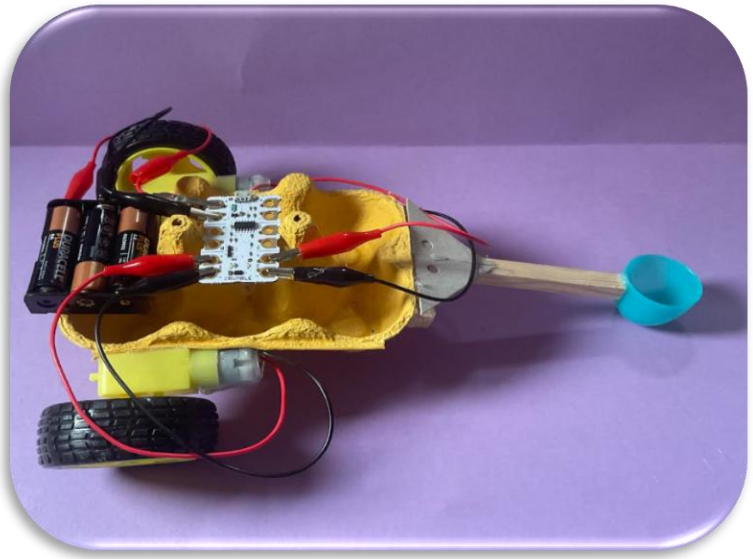
PRACTICAL

Applying a range of skills across the six strands of learning

- Wider skill set
- Accuracy
- Confidence
- Independence / choosing the right skill for the right task / Choosing the right tool for the job
- Quicker
- Safer

KNOWLEDGE BUILDING IN DT

Year 5 & 6 Big Projects



KNOWLEDGE BUILDING IN DT

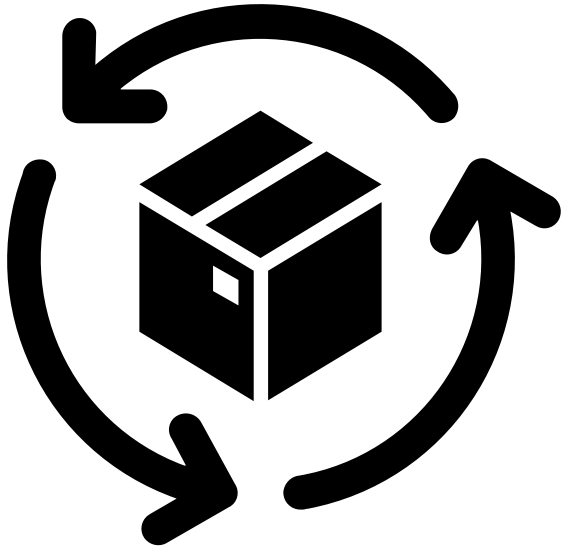
SUBJECT KNOWLEDGE

TECHNICAL KNOWLEDGE

DISCIPLINARY KNOWLEDGE

PRACTICAL KNOWLEDGE

Identifying the knowledge



Start with product and work backwards

PROGRESSION DOCUMENT

NATIONAL CURRICULUM

Overview of the curriculum, just broad brushstrokes.

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.

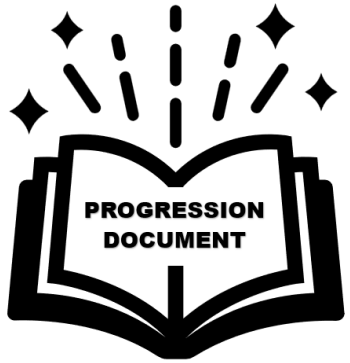
EARLY YEARS

- EYFS Framework
- Early Learning Goals

KNOWLEDGE

SEQUENCE OF KNOWLEDGE THAT THE CHILDREN ARE EXPECTED TO KNOW AND REMEMBER

PROGRESSION DOCUMENT



Progression Document: The Map of the Learning Journey

Schools should plan out the knowledge (and skills) that children should know at each stage of their learning journey. (Ofsted RI schools)

EFFECTIVE USE OF A PROGRESSION DOCUMENT IN DESIGN TECHNOLOGY

KNOWLEDGE & SKILLS AT EACH STAGE OF THE LEARNING JOURNEY

CURRICULUM PLANNING

At each stage of the learning journey are units of work that deliver the knowledge, skills and build understanding.

ASSESSMENT

What knowledge and skills need to be secured at this stage of the children's learning? Do the children know what they should know?

TEACHER GUIDANCE

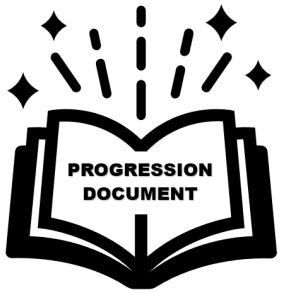
Where the unit they are teaching fits in. What knowledge and skills do the children already know?
What comes after?

TRACKING

Are children keeping up with the curriculum? Are they on-track to reach end of key stage expectations?

How can we demonstrate progression in DT – Teach the Curriculum!

PROGRESSION DOCUMENT



Progression Document Format

- Progression document is a series of learning statements of the core/essential knowledge that children are expected to know and remember.
- Learning statements are sequenced through a series of stages – 2 Year Phases. This allows children to have more than one attempt to secure the learning statement – avoid having a progression document that is topic specific.
- They either know it, or they don't. If they do – move on. If they don't – reteach (not the same activity)
- Avoid phrases such as: Beginning to…..Developing…..Has an awareness of…. (too subjective)
- Clear, succinct phrases helps teachers in developing tasks for formative and summative assessment. (Children know….. Children know how to…..)

PROGRESSION DOCUMENT

Progression Document Format

Learning statements differentiated into knowledge and skills
Can be assessed as either achieved or not achieved
Statements cover a two-year learning phase

Curriculum Pathway: Making		
	Substantive Knowledge	**Practical Knowledge Skills**
KS1	**Children will know:** • To keep themselves safe when making things. • Simple procedures for working hygienically with food. • About a range of materials and their properties and how they can be used when making a product. • Improving a product whilst making it is an important part of design technology.	**Children will know how to:** • Follow instructions to make a product from a design. • Select and use tools most appropriate for a practical task. • Measure and mark out different materials when working with them. • Cut and shape a range of materials using different tools and techniques. • Assemble, join, and combine a range of materials using different methods and techniques. • Apply a range of different finishing techniques to their made product.
LKS2	**Children will know:** • Rules and procedures for keeping themselves safe when making products. • The properties of materials that they are working with and how these determine the tools and techniques that they use. • That a list of the main stages of turning a design into a product will aid the making process. • What different components of a system do and how these can be incorporated into their product to make them work.	**Children will know how to:** • Follow instructions to ensure that they work safely. • Select suitable tools, equipment, materials, and components for the task. • Explain their choices of materials, techniques and tools when making a product. • Measure, mark out, cut and shape materials with increasing accuracy. • Select and apply a finishing technique to create a quality product. • Identify and implement ways of improving a product whilst making it.
UKS2	**Children will know:** • Choosing materials, tools and equipment is dependent upon the skills and techniques to be used. • Step-by-step action plans should be created and followed when making complex products. • A range of different finishing techniques and choose ones that are suitable to create a quality product.	**Children will know how to:** • Work responsibly using guidelines to ensure they keep themselves and others safe. • Write an action plan for the making process including lists of tools, equipment and materials needed. • Accurately assemble, join and combine materials and components to ensure a quality finish to a product. • Apply a range of decorative and finishing techniques following the product design.

PROGRESSION DOCUMENT

Progression Document Format

Disciplinary Knowledge Isolated – greater understanding of the learning journey/progression in designing, making and evaluating

Curriculum Pathway: Designing		
	Substantive Knowledge	**Practical Knowledge Skills**
KS1	**Children will know:** • A product is something that is made to do a job or fulfil a need. • A design brief describes the product that is to be made • A product is made for a person known as the client • Drawing out design ideas is useful to see how the product will look. • Using model and construction kits can help to develop their ideas and designs.	**Children will know how to:** Designing Skills • Research similar existing products, including online research. • Use knowledge of existing products to help with generating their own ideas. • Explain what their product is and how it will work. Drawing Skills • Generate and communicate ideas using sketches, drawing and digital software. • Create clearly labelled drawings to explain how their product works.
LKS2	**Children will know:** • The difference between a design brief and design specifications. • Design specifications describe how a product should be made, how it works or what it should do. • How making models of their intended product can help in the design process. • There can be a range of people and places that can be clients for a product. • How computer-aided design software can help in the design process.	**Children will know how to:** Designing Skills • Conduct research, including consumer surveys to find out needs and wants of the client • Generate ideas for a product, considering its purpose and who the client is. • Design a product that meets client's needs and the design brief. • Use design specifications as a guide to the making process. • List the design features that will appeal to the client. Drawing Skills • Communicate and draw out their designs using three-dimensional techniques such as 'crating' and isometric drawing. • Use computer software to show what their final product will look like.
UKS2	**Children will know:** • Creating a prototype of a design is useful for checking ideas and seeing how well they work. • Different types of drawing can be used to help with designing and communicating ideas about a product. • How labels and annotated drawings can be used to explain and communicate how a product is made and how it will work. • Surveys, interviews and questionnaires are used to find out the needs and wants of clients.	**Children will know how to:** • Carry out different surveys and questionnaires for research and to help with the design process. • Write step by step instructions and recipes to make a product they have designed. • List the materials and tools that will be needed to make a product they have designed. Drawing Skills • Communicate their ideas using cross-sectional drawings and cut-away drawings. • Use computer-aided design software to develop and communicate their ideas.

PROGRESSION DOCUMENT

Progression Document Format

Separate learning journey for each strand of learning in DT
Learning statements differentiated into knowledge and skills
Could include an additional learning journey for vocabulary

Curriculum Pathway: Materials / Textiles		
	Substantive Knowledge	**Practical Knowledge Skills**
KS1	**Children should know:** **Materials** • Sheet materials refers to materials that are flat. • Sheet materials can be folded to create three-dimensional shapes. **Textiles** • Some joining techniques are permanent and others are temporary. • Temporary joining techniques might be used when pinning fabric to hold it together (so it doesn't move around whilst cutting or sewing) • Permanent joining technique might be used to finish a products so it can be used without falling apart. • A template (or fabric pattern) can be used to cut out the same shape multiple times.	**Children should know how to:** **Materials** • Measure and mark out to the nearest centimetre. • Cut sheet materials safely using tools provided. • Shape sheet materials through folding, creasing, and curling. • Use shape to increase the strength and stiffness of a structure. • Join materials through gluing and by making slots. **Textiles** • Thread a needle. • Cut fabrics neatly for sewing. • Pin and cut fabric using a template. • Join fabrics using an evenly spaced running stitch. • Colour and decorate textiles using techniques such as painting, printing and simple stitching.
LKS2	**Children should know:** **Materials** • That products are made of materials that are chosen because of their properties. **Textiles** • That 'joining technique' means connecting two pieces of fabrics together and the methods that are permanent or temporary. • A range of joining techniques to connect two pieces of fabrics together such as sewing and gluing. • Joining two edges of fabrics together creates a seam. • A range of sewing techniques (such as a running stitch for making seams and cross stitch for decoration) • Applique is a way of decorating textiles by adding smaller pieces of fabric to create a picture or a pattern.	**Children should know how to:** **Materials** • Measure, mark-out, cut and shape a wide range of materials. • Cut internal shapes and joining slots in sheet materials. • Join and combine materials and components using a variety of methods. • Manipulate different materials to create different effects by cutting, creasing, and folding. **Textiles** • Measure, mark out and cut fabric using a paper template (pattern) • Join fabrics together using a range of different sewing techniques (such as running stitch and cross stitch) including allowing for a seam. • Create a 3D fabric product by combining fabric pieces and using a seam allowance. • Apply a range of decorative techniques, including embroidery stitches, to different fabric materials.
UKS2	**Children should know:** **Materials** • The different properties of materials and how they are considered when designing and making a product. **Textiles** • Blanket stitch is used to strengthen edges and when joining to fabrics. • The importance of using a template (pattern) to accurately mark out a design on a fabric.	**Children should know how to:** **Materials** • Measure and cut materials with precision and refine the finish with appropriate tools. **Textiles** • Join textiles with a combination of stitching techniques (such as blanket stitch, back stitch for seams and running stitch to attach decoration). • Create products by joining several fabric pieces that employ a seam allowance. • Use the qualities of materials to create suitable visual and tactile effects in the decoration of masks and textile products.

How do you assess foundation subjects, including design technology, in your school?

Is there a common approach/format across all subjects?

ASSESSMENT IN DESIGN TECHNOLOGY

Assessment information provides answers to two questions:

- Are children learning the core/essential knowledge that has been identified?
- Are children keeping up with the curriculum?

Do children know and can they remember (apply) the core essential knowledge? – Yes or No?
(assessing knowledge forces teachers to teach it!)

Have children secured the knowledge appropriate for their stage of learning? Are they 'on-track' to reach end of key stage expectations – Yes or No?

RECORDING ASSESSMENT

Based on the progression document – set of learning statements

- What children should know
- What children should be able to do

Children should know:	Child A	Child B	Child C	Child D	Child E	Child F	Child G	Child H	Child I	Child J
The difference between a design brief and design specifications.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
How making models of their intended product can help in the design process.						✓	✓	✓	✓	✓
How to generate ideas for a product, considering its purpose and who the client is.			✓	✓	✓	✓	✓			
How to design a product that meets client's needs and the design brief.					✓	✓	✓	✓	✓	✓
How to measure, mark out, cut and shape materials with increasing accuracy.			✓	✓	✓	✓	✓	✓	✓	✓
How to select and apply a finishing technique to create a quality product.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rules and procedures for keeping themselves safe when making products.						✓	✓	✓	✓	✓
What different components of a system do and how these can be incorporated into their product to make them work.		✓	✓			✓	✓	✓	✓	✓
When evaluating products, it is important to use the design brief and the design specifications as a guide.		✓	✓			✓	✓	✓	✓	✓
Air in pneumatic systems creates movement.			✓	✓	✓	✓	✓	✓	✓	✓
How to create moving products that include pneumatic systems.			✓	✓	✓	✓	✓	✓	✓	✓
Children working at expected / Keeping up with the Curriculum	**x**	**x**	✓	✓	✓	✓	✓	✓	✓	✓

Part A: Quality Assuring the Curriculum

Recording Children's Learning

ACTIVITY: WHY RECORD CHILDREN'S LEARNING?

How is it useful?

Children

Teachers

Leaders

ACTIVITY: WHY RECORD CHILDREN'S LEARNING?

How is it useful?

Children

- Activity to embed and consolidate knowledge (instead of just passively listening)
- Helps children to understand and refer back to
- Makes the subject 'proper'
- Opportunity for individual, independent learning
- Communicating ideas – key aspect of design (drawings, sketches, CAD, photographs, video clips)

Teachers

- Class management tool (as long as it is useful and contributes to the learning journey)
- Record of children's learning
- Teaching tool – knowledge recall
- Exemplar work for other teachers

Leaders

- Evidence of the subject being taught regularly
- Evidence of the breadth and scope of the curriculum
- Evidence of whether the children (and teachers) place value on the subject

RECORDING CHILDREN'S LEARNING IN DT

Presents a Unique Challenge:

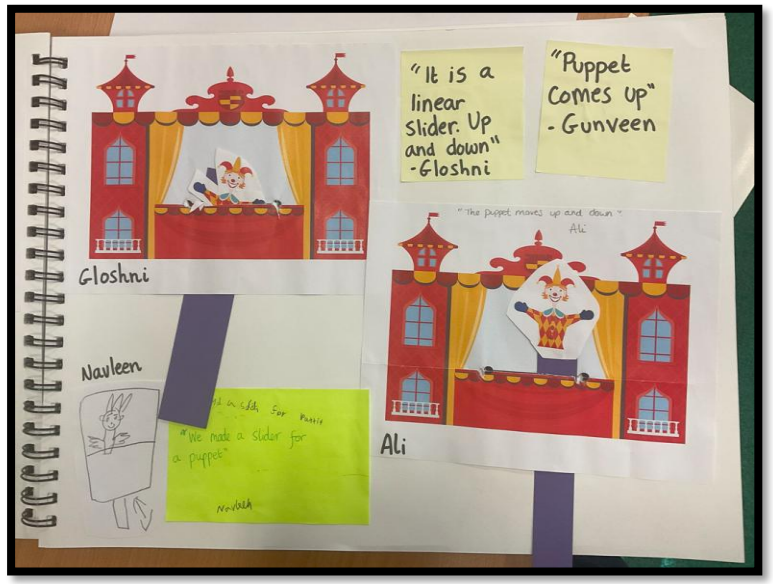
- Highly practical subject
- End-product is physical and not written
- Children of ten work in pairs, small groups.

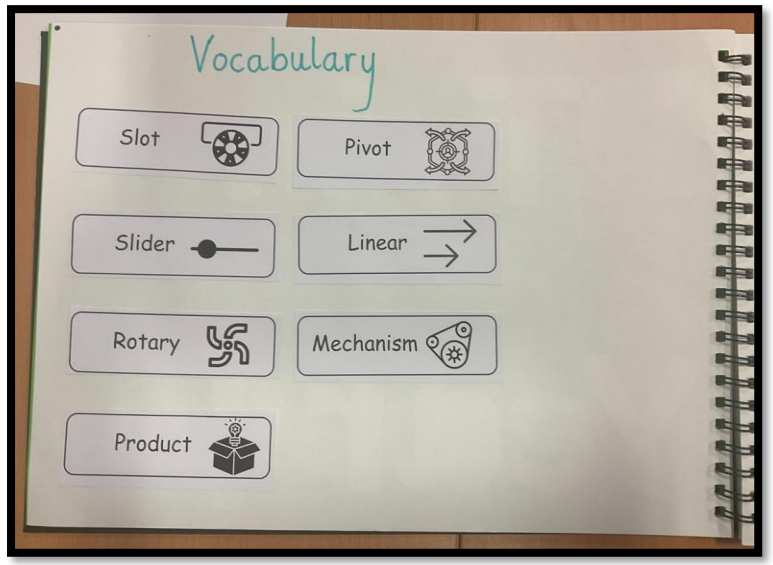
Options:

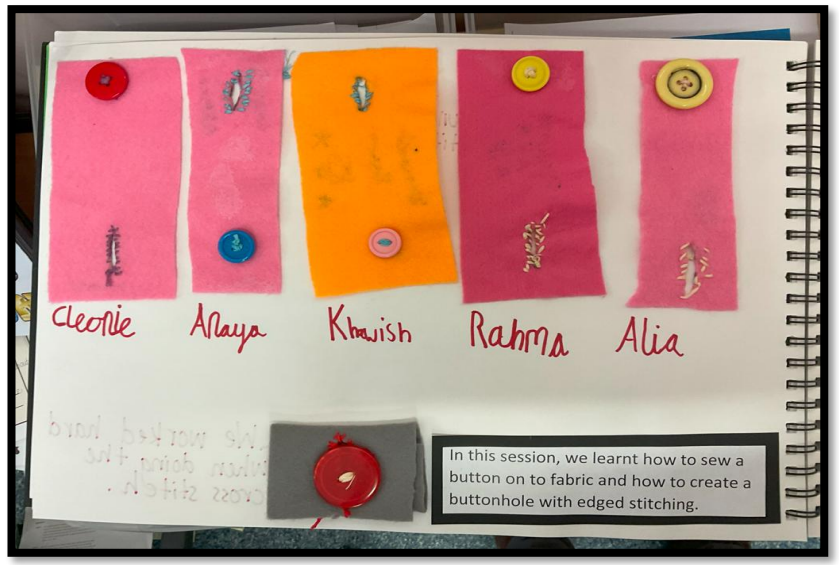
- Exercise book
- Folder and loose leaves
- Floor books
- Structured workbooks (for each topic)
- A3 Folded Booklets

USING FLOORBOOKS IN DESIGN TECHNOLOGY

RECORDING CHILDREN'S LEARNING







Showcase children's learning

Record their thoughts, ideas

Use as a teaching aid (review, recap, link to other topics)

Evidence of children's learning journey

Opportunity for children to look back (review and reflect)

Records practical outcomes/ group work / whole class learning/visits

USING FLOORBOOKS IN DESIGN TECHNOLOGY

- Whole-school expectation
- Floorbooks – Quality but expensive
- Reduces marking / time given over to developing them
- Resources – fancy pens, stickers, post-it notes
- Becomes another tool for teaching and learning
- As part of learning sequence – children choose the content
- As children get older – more responsibility for them

Evidence that the subject is being taught:

- Cooking activities
- Investigations
- Record key activities and focused practical task.

Subject/School Leaders

- Is it being taught?
- Curriculum Coverage
- Sequence of Learning

10 minutes at the end of each term.

Part A: Quality Assuring the Curriculum

Evidencing the Quality of the Curriculum

What is the role of the DT Subject Leader?

EVIDENCE GATHERING ACTIVITIES

- LESSON VISIT
- BOOK LOOK (MONITORING)
- TALKING WITH CHILDREN
- TALKING WITH TEACHERS
- ASSESSMENT DATA

Activities to gather evidence about the quality of the curriculum/curriculum learning and not teacher performance

EVIDENCE GATHERING ACTIVITIES: LESSON VISIT

- Are children engaged? / on task? / enthusiastic about their learning?
- Is there a clear purpose to the lesson – has the knowledge been identified?
- How confident and capable is the teacher? (secure subject knowledge)
- Are the learning activities/tasks appropriate to secure the knowledge?
- How is the learning supported through provision of resources?
- How are children being supported, identified for support?
- Management of learning (Health, Safety and Hygiene)

- Lesson Visit also an opportunity to embark on:
- Book Look
- Talking with Children

EVIDENCE GATHERING ACTIVITIES: BOOK MONITORING

- Is there evidence in the children's books of DT being taught and taught regularly?
- Is the breadth and scope of the curriculum being taught?
- Are prescribed plans/schemes of work/progression documents being followed in sequence?
- Is there evidence that they key knowledge is being taught? (new knowledge, consolidation and linking knowledge) – are children building knowledge?
- Range of activities to encourage children's learning – not just worksheets.
- How children's communicating ideas is developing (designing, drawing etc..)
- What is the quality of the children's work in their books? Do they take pride in their work? Assess how much value they place on the subject.

EVIDENCE GATHERING ACTIVITIES: TALKING WITH CHILDREN

- Do children know and can they remember the key knowledge? (Progression document)
- Is their explanation of the knowledge that they know correct?
- Can they recall products, processes and projects they have undertaken previously?
- Do they know stories and fun facts and talk enthusiastically about DT?
- Are they linking new knowledge to existing knowledge (knowledge building)
- Do children talk about their learning in the subject with enthusiasm whilst using technical vocabulary?
- Can they explain how things work and/or how they are made?
- Do they know what they should know at the stage of the curriculum learning journey (progression document)

EVIDENCE GATHERING ACTIVITIES: ASSESSMENT DATA

- Are teachers assessing? (Core knowledge and tracking expected children)
- What proportion of children reach end of key stage expectations?
- How many are currently 'on-track' to reach end of key stage expectations?

- Are there any gaps in children's knowledge – investigate further….
- Are there any groups of children 'not on track'? I investigate further

Investigate:

- Curriculum (scheme of work)
- Resources
- Pedagogy
- Teaching

Is the curriculum / progression document working to deliver end of key stage expectations?

EVIDENCE GATHERING ACTIVITIES: TALKING WITH TEACHERS

This conversation is likely to be the final piece of evidence gathering

- Do teachers understand the learning sequence? (Progression document) – what knowledge were the children building on and what comes next?
- Key knowledge identified in the lesson - did the children know it? How do they know they achieved it? (AFL)
- How well are children progressing in design technology? (Use assessment information to discuss reality)
- Did the teacher enjoy the lesson? Do they like teaching DT?
- Talk about their subject knowledge, training needs.
- How could outcomes for children be improved in design technology (resources, curriculum, support in lessons etc.)

What happens next????

What happens next????

- Subject action plan / improvement plan
- Staff development / training
- Whole school support
- Individual support
- Resources – please for funding

Part B: Subject Knowledge: Systems

Introduction to Systems

The National Curriculum

Mechanical Systems (Key Stages 1 & 2)

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts. When designing and making, pupils should be taught to:

KS1: Explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products.

KS2: Understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]

The National Curriculum

Electrical and Program Systems (Key Stage 2)

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts. When designing and making, pupils should be taught to:

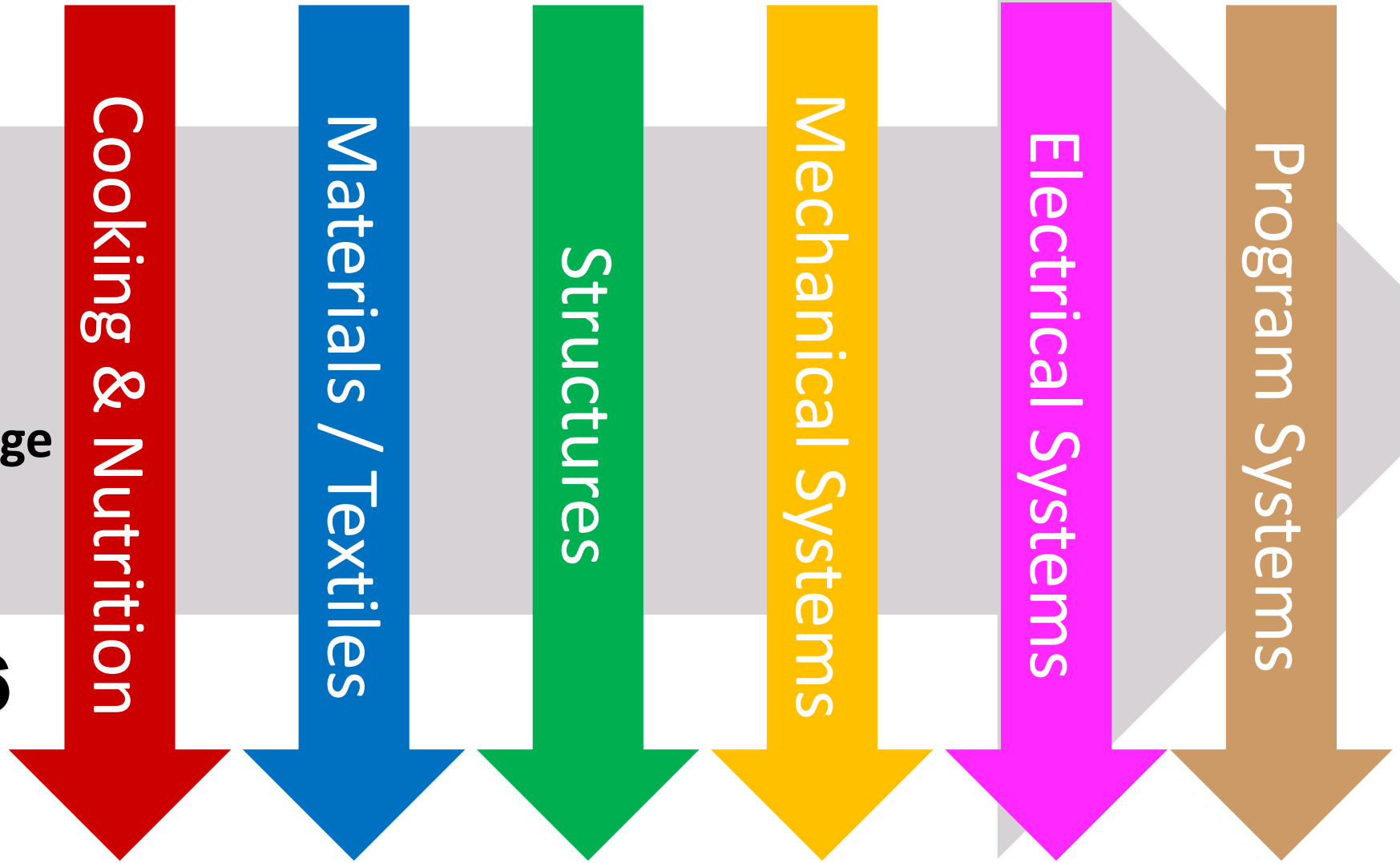
- Understand and use electrical systems in their products (for example, series circuits incorporating switches, bulbs, buzzers and motors)
- Apply their understanding of computing to program, monitor and control their products.

DESIGN TECHNOLOGY CURRICULUM

EYFS

Designing
Making
Evaluating
Technical Knowledge
Vocabulary
Designers

YEAR 6

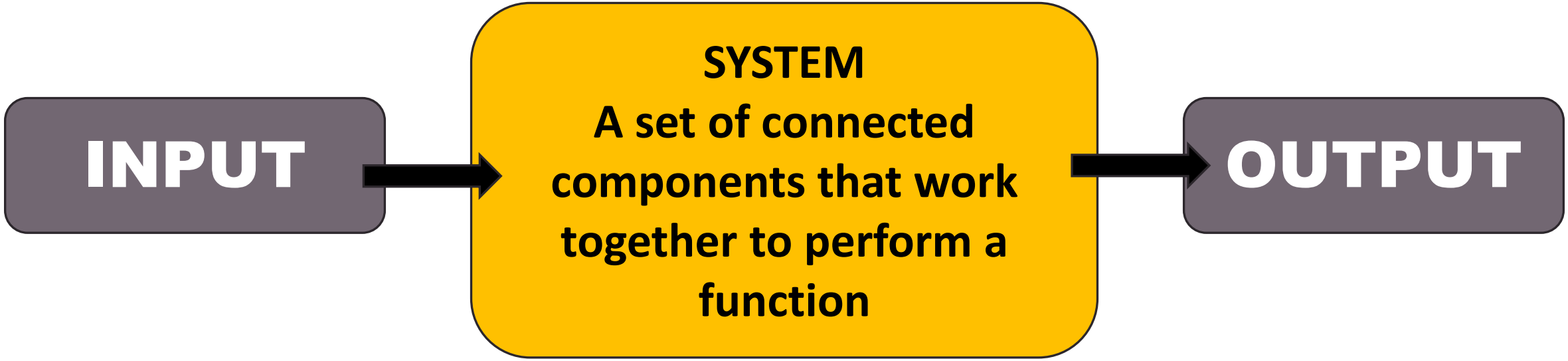


EXEMPLAR LONG TERM PLAN

	Cooking and Nutrition	Materials / Structures	Systems
Y1	Cooking and Nutrition	Sheet Materials / Textiles	Mechanical Systems Sliders, Levers, Pop Ups
Y2	Cooking and Nutrition	Structures	Mechanical Systems Wheels and Axels
Y3	Cooking and Nutrition	Sheet Materials / Textiles	Mechanical Systems Levers and Linkages / Pneumatics
Y4	Cooking and Nutrition	Structures	Electrical Systems
Y5	Cooking and Nutrition	Sheet Materials / Textiles	Computer Systems Lights and Sensors
Y6	Cooking and Nutrition	Mechanical Systems Cams / Pulleys / Gears	Computer Systems Controllable Vehicle

KEY LEARNING - SYSTEMS

ALL SYSTEMS HAVE AN INPUT AND AN OUTPUT



Children design and make products that incorporate a system that makes the product function as it should.

Mechanical Systems

MECHANICAL SYSTEMS

ALL SYSTEMS HAVE AN INPUT AND AN OUTPUT
KNOWING THAT MECHANICAL SYSTEMS PRODUCE MOVEMENT
DESIGN AND MAKE PRODUCTS THAT HAVE A MECHANICAL SYSTEM

KNOWING & UNDERSTANDING SPECIFC MECHANICAL SYSTEMS

- **Sliders**
- **Pop up mechanisms**
- **Levers and linkages**
- **Wheels and axles**
- **Pulley systems**
- **Cams**
- **Gears**

Pneumatics – not mentioned in the National Curriculum – good for practical models (syringes) Input and Output.

TYPES OF MOVEMENT

- **Linear movement**
- **Rotational movement**
- **Reciprocating movement**
- **Oscillating movement**

Knowing and identifying different types of movement in different mechanical systems

The National Curriculum

Key Stage 1

Pupils should be taught to:

- Explore and use mechanisms in their products.

Key Stage 2

Pupils should be taught to:

- Understand and use mechanical systems in their products

Electrical Systems

ELECTRICAL SYSTEMS

ALL SYSTEMS HAVE AN INPUT AND AN OUTPUT

UNDERSTANDING AND MAKING SIMPLE CIRCUITS USING A RANGE OF COMPONENTS
- **Batteries, Wires, Bulbs**
- **Buzzers, Motors, Switches**

USING ELECTRICAL CIRCUITS IN PRODUCTS

CONTROLLING ELECTRICAL SYSTEMS (INPUTS & OUTPUTS)

Switches – on or off (choosing the right switch)

Program Systems

PROGRAM SYSTEMS

ALL SYSTEMS HAVE AN INPUT AND AN OUTPUT

UNDERSTANDING AND MAKING SIMPLE CIRCUITS USING A RANGE OF COMPONENTS
- **Batteries, Wires, Bulbs**
- **Buzzers, Motors, Switches**

USING ELECTRICAL CIRCUITS IN PRODUCTS

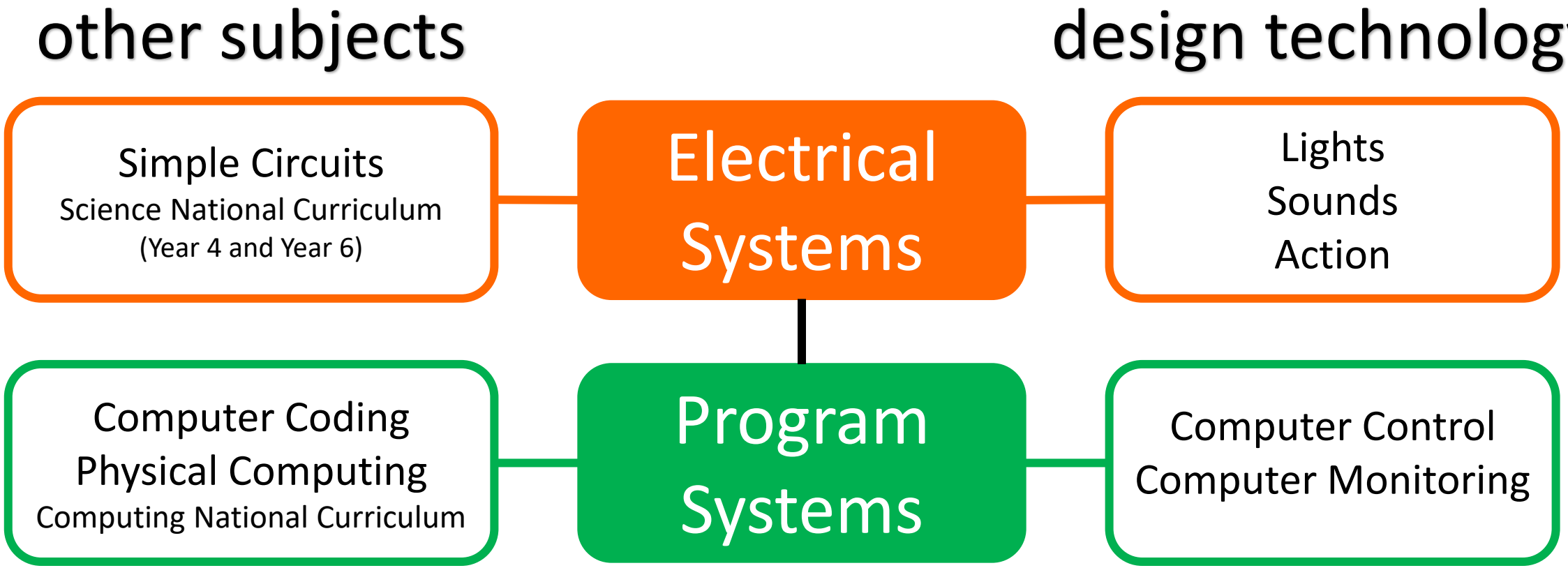
CONTROLLING ELECTRICAL SYSTEMS (INPUTS & OUTPUTS)
- **More complex inputs and outputs controlled by computing (Block Coding)**
- **Inputs and outputs controlled by using sensors in a system.**

The National Curriculum

Key Stage 2

Pupils should be taught to:
- Understand and use electrical systems in their products
- Apply their understanding of computing to program, monitor and control their products

CURRICULUM COHERENCE



Part B: Subject Knowledge: Systems

Mechanical Systems

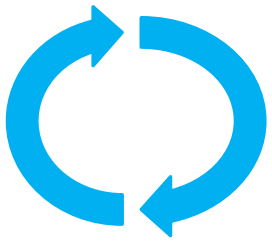
What is a Mechanism?

A mechanism is a system of moving parts that work together to create movement or change movement.

A mechanical system has an input and an output

A mechanism helps us to do things and makes jobs easier.

There are four types of movement:



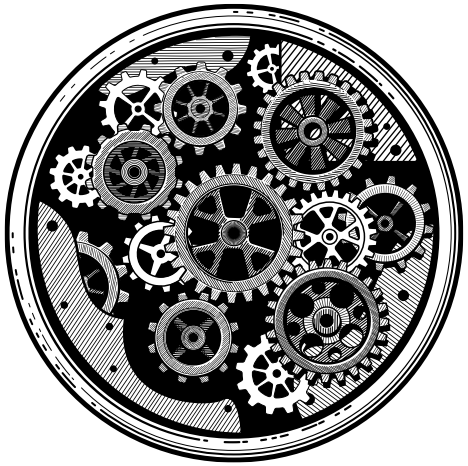
Rotational

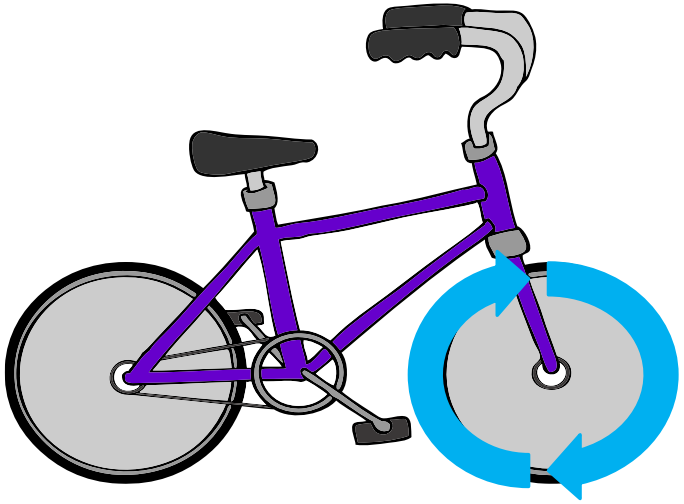
Oscillating

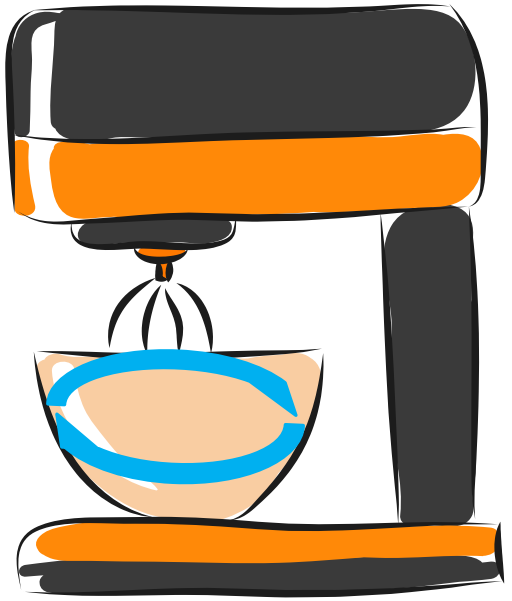
Reciprocating

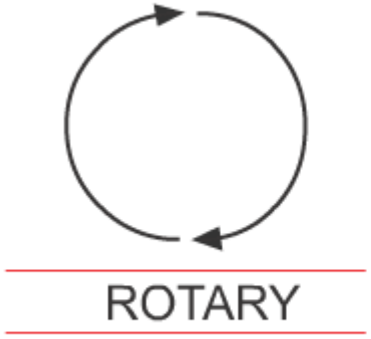
Linear

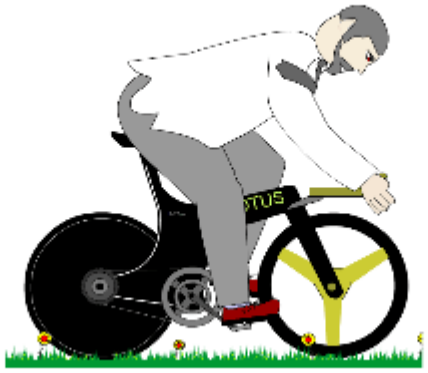
MECHANISMS: ROTATIONAL MOVEMENT



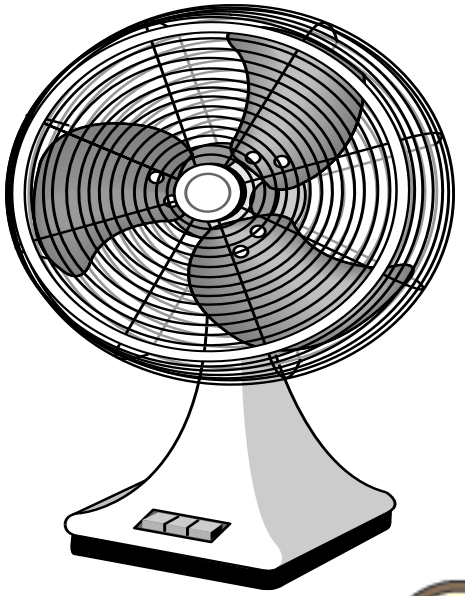


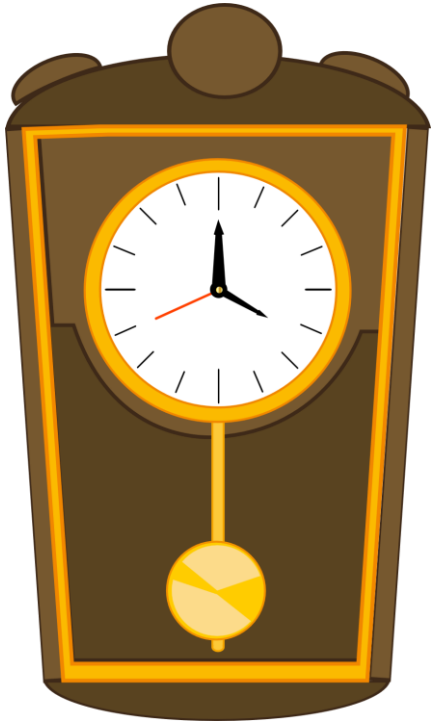




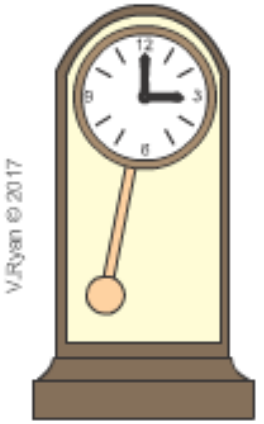


MECHANISMS: OSCILLATING MOVEMENT



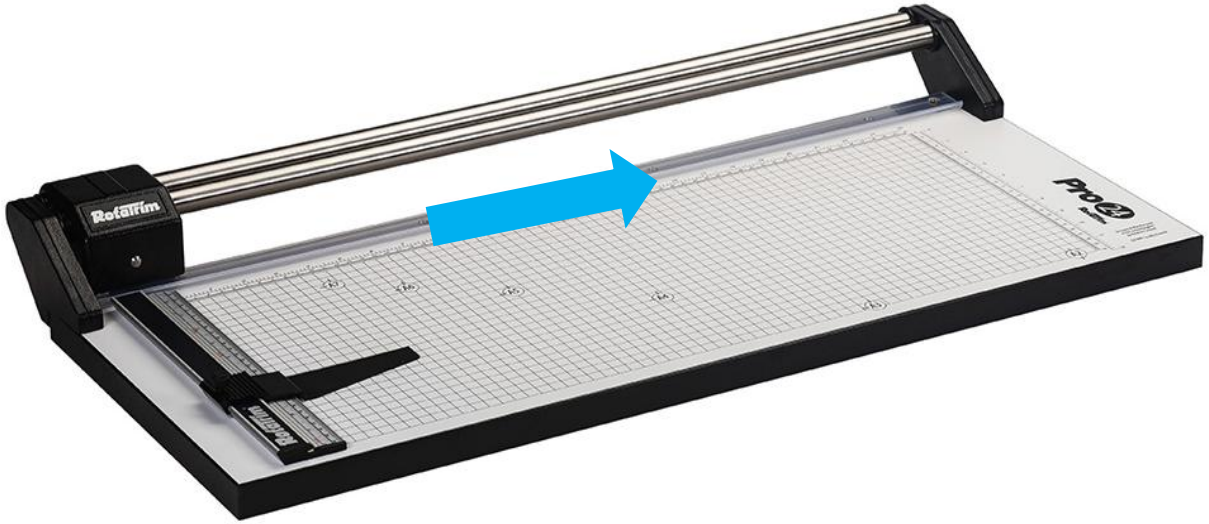


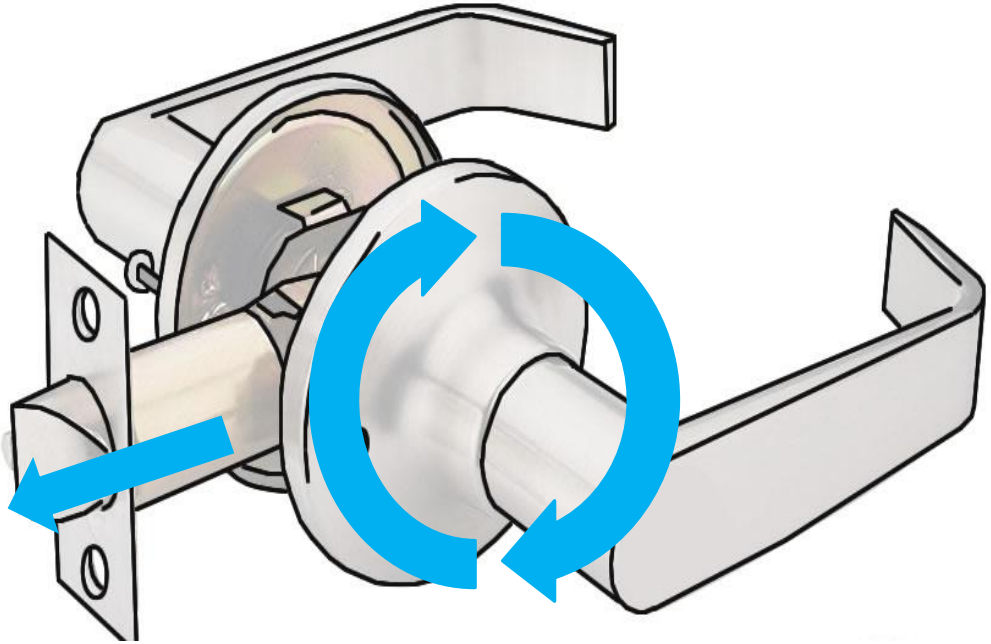
OSCILLATING



PENDULUM CLOCK

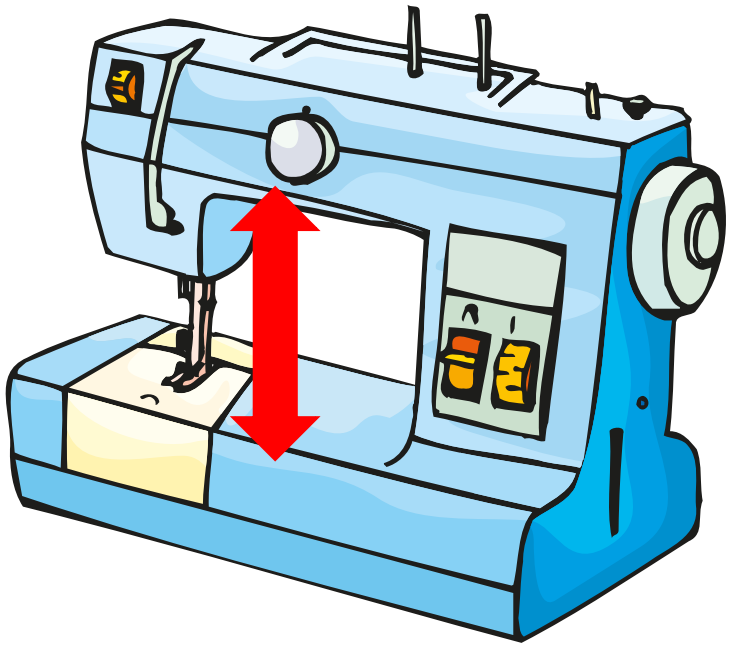
MECHANISMS: LINEAR MOVEMENT

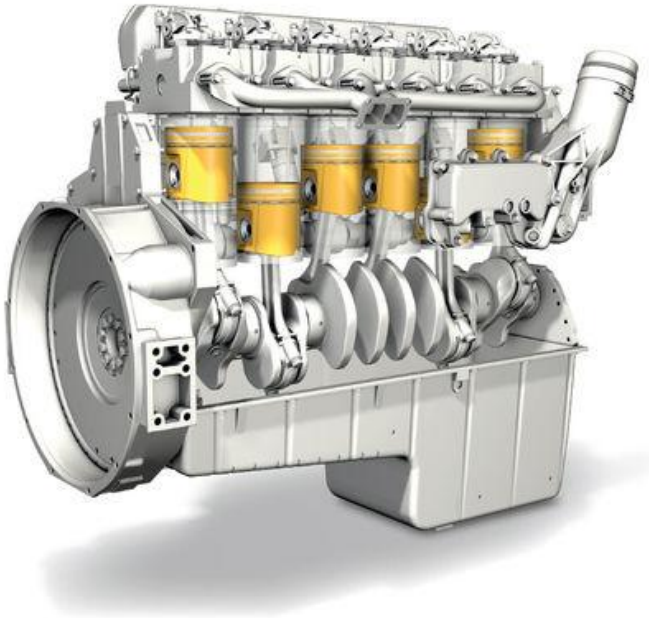




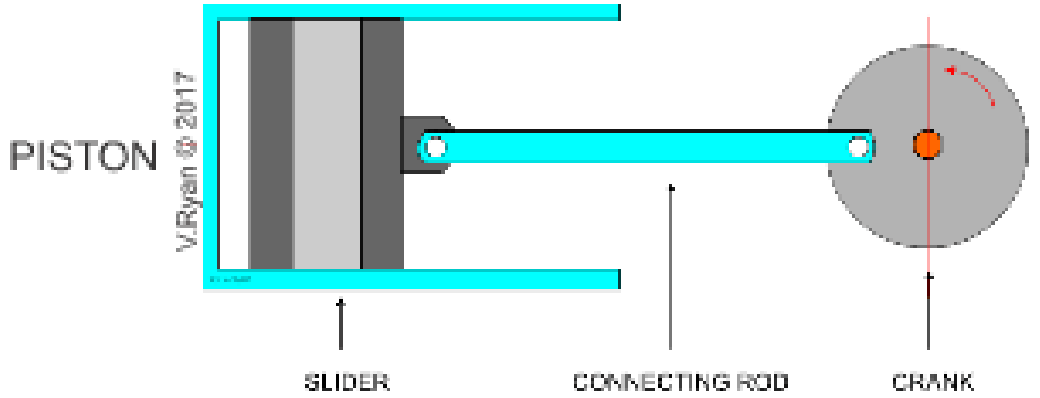
LINEAR

MECHANISMS: RECIPROCATING MOVEMENT





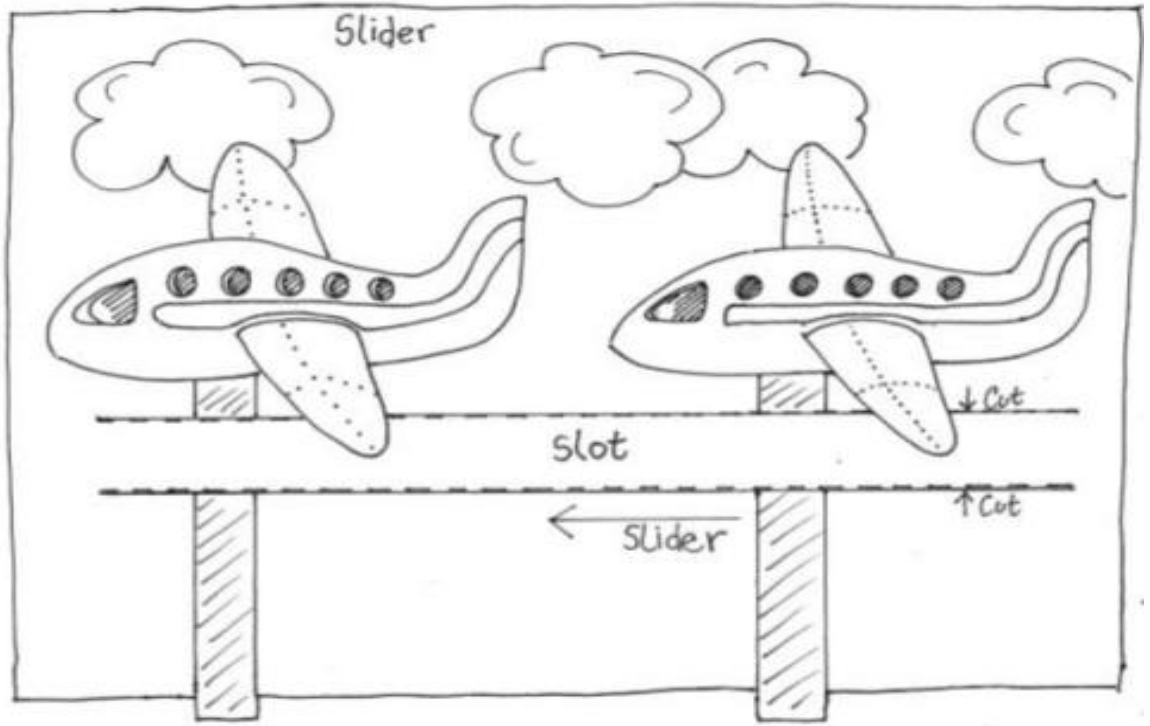
RECIPROCATING

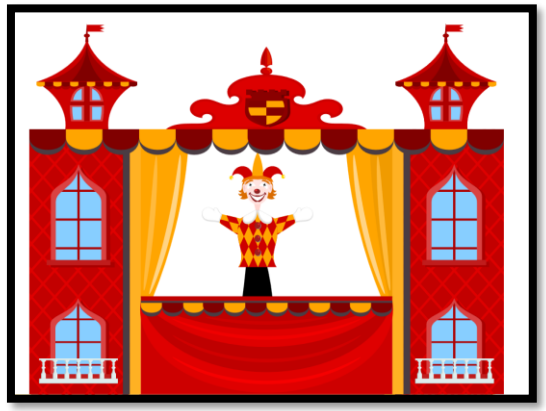


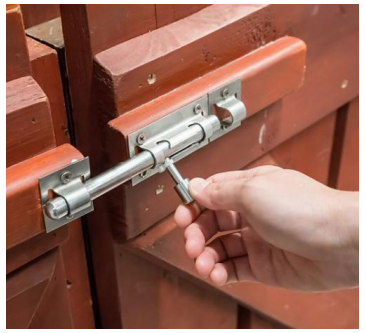
MECHANICAL SYSTEM: SLIDERS

KS1

A slider is a very simple mechanism that has a bar or rod that moves in a linear direction. The bar is supported by a guide (slot, rail, bracket, groove) which ensures that the linear movement is in a straight line.



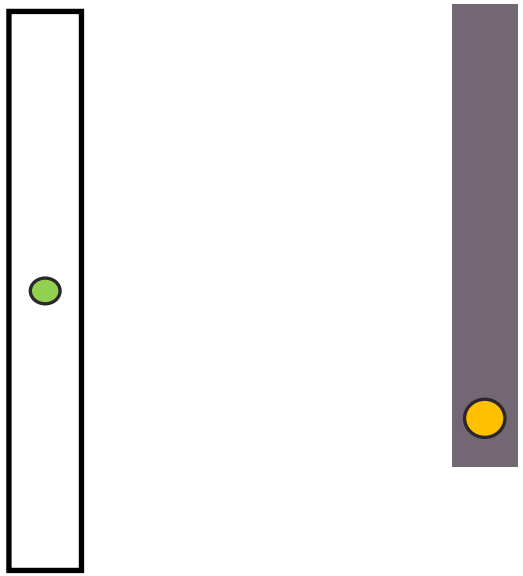


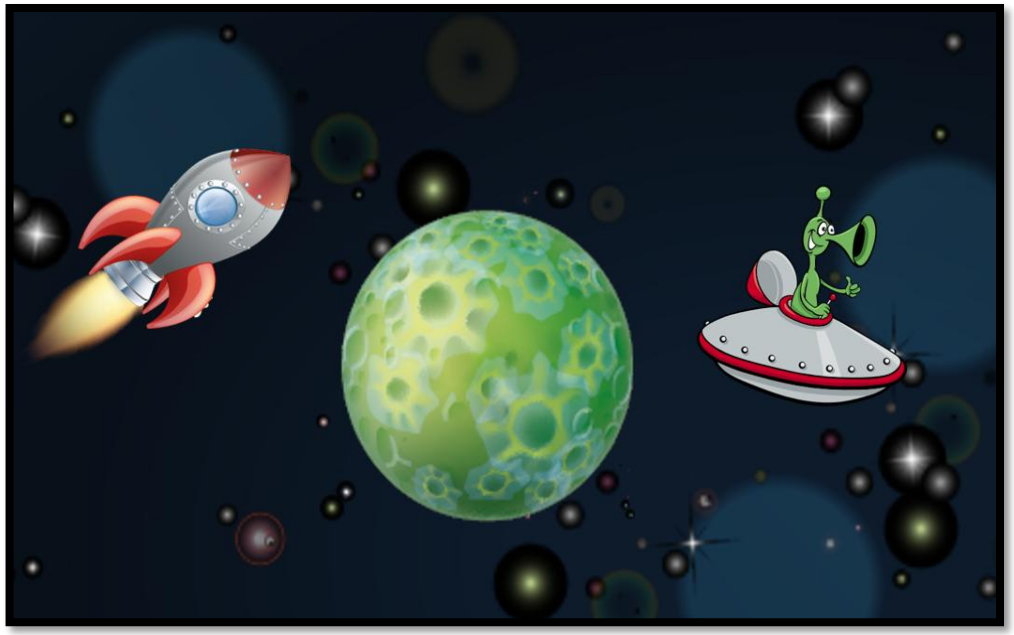


MECHANICAL SYSTEM: LEVERS

KS1

A lever is a very simple mechanism that has a bar or rod that moves in a rotational direction. The bar rotates around a fixed pivot.

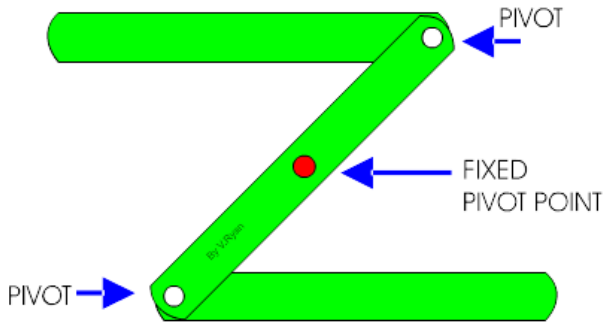


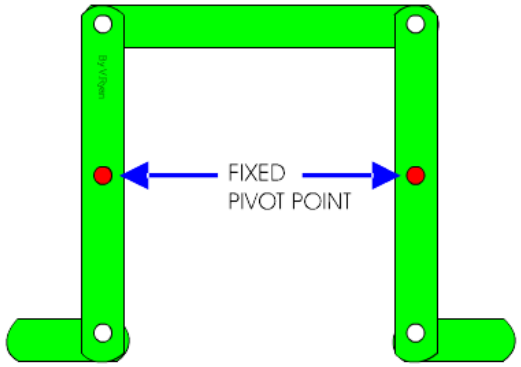


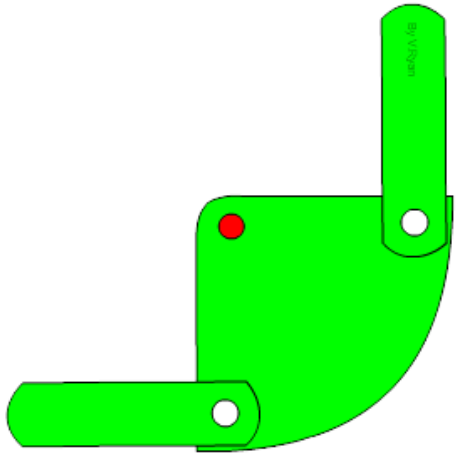
MECHANICAL SYSTEM: LINKAGES

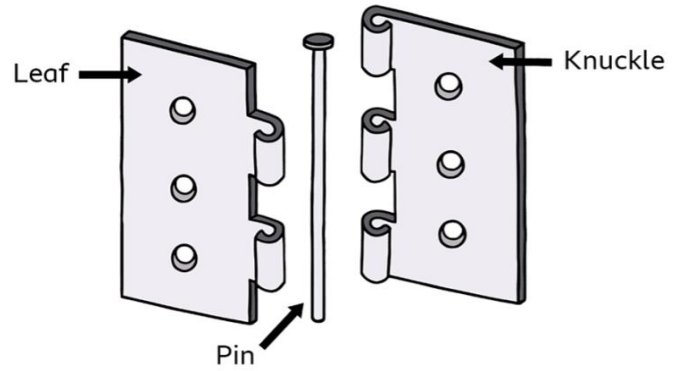
LKS2

Joining two levers together using a loose pivot creates a linkage mechanism.



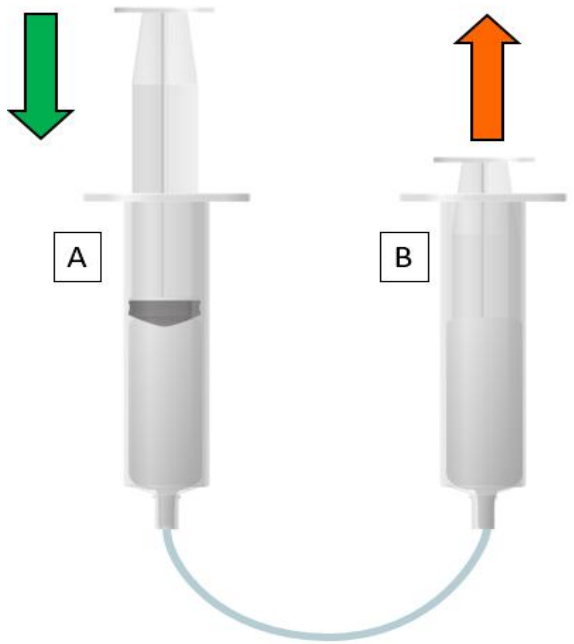






MECHANICAL SYSTEM: PNEUMATICS

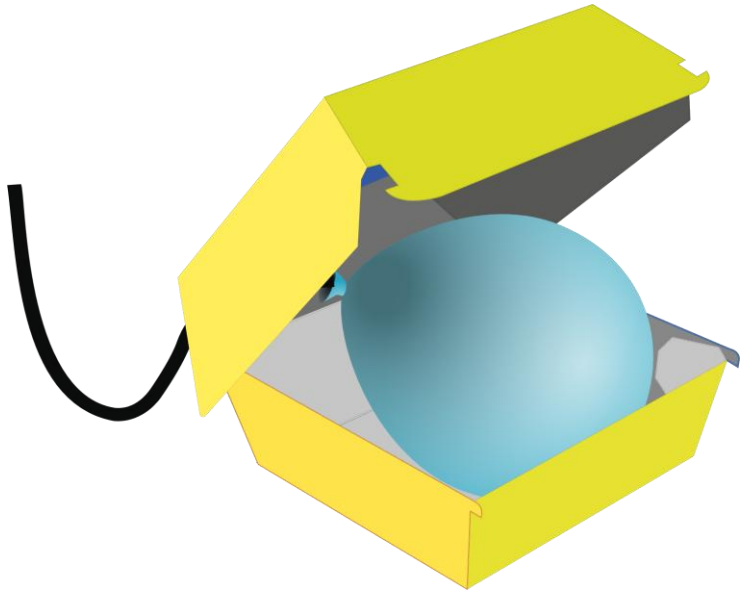
LKS2



If pressure is put on piston A, the same pressure will be transmitted to piston B

- Transfer of motion (from A to B)
- Change of direction (down to up)
- Height of drop A = Height of B rise

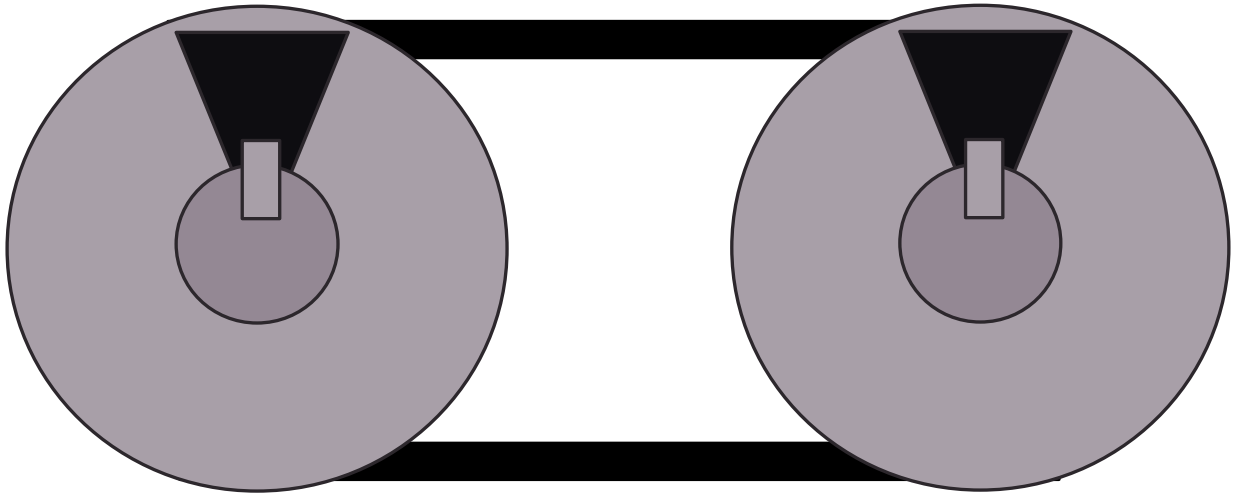
A pneumatic system is one that uses the pressure of compressed air (air that has been squashed tightly into a space) to make something move.



MECHANICAL SYSTEM: PULLEYS

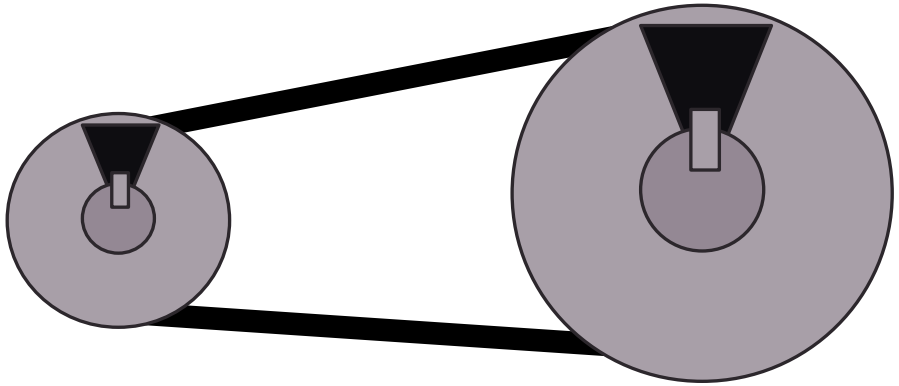
KS2

A pulley system is a mechanical system that transfers movement from one pulley (wheel) to another.

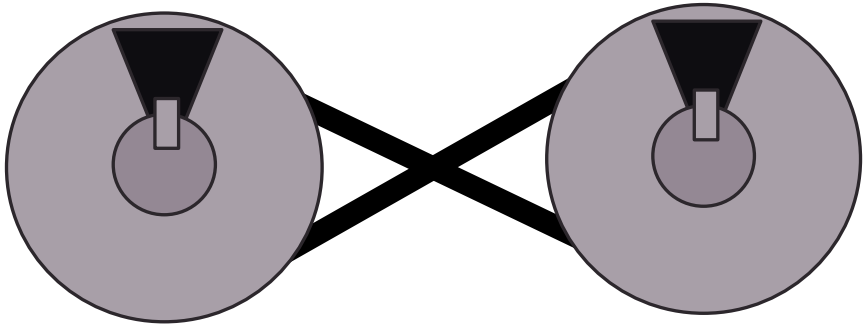


Driver Pulley

Driven Pulley



Change of speed

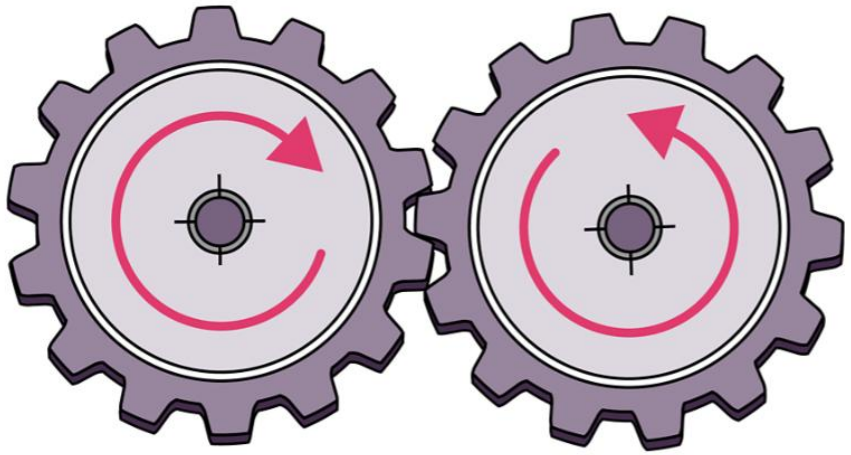


Change of direction

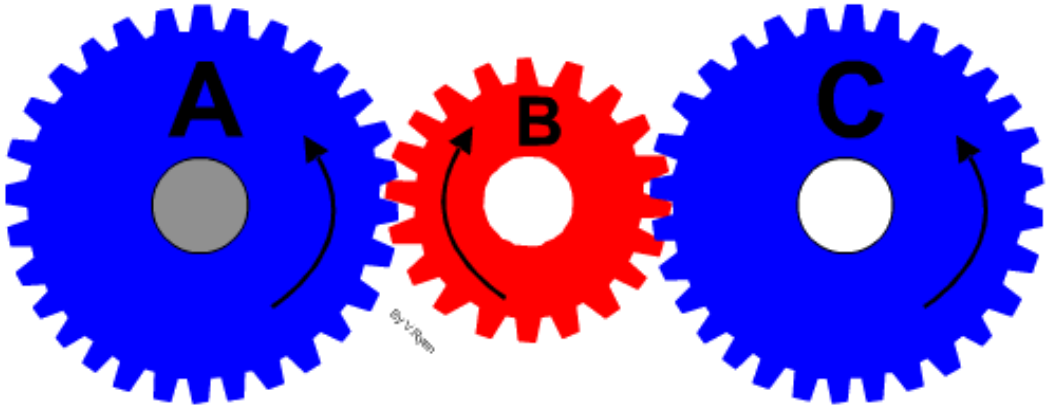
MECHANICAL SYSTEM: GEARS

KS2

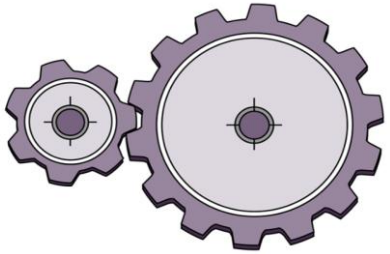
Gears are special wheels that have teeth. These teeth interlock with another gear, belt or chain. When two gears are connected, they transfer the movement and the power from one gear to another.



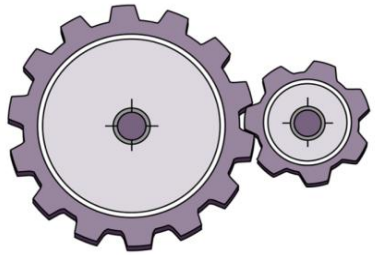
Driver Gear Driven Gear



DRIVER IDLER DRIVEN



Small Driver: Large Driven
Increases speed

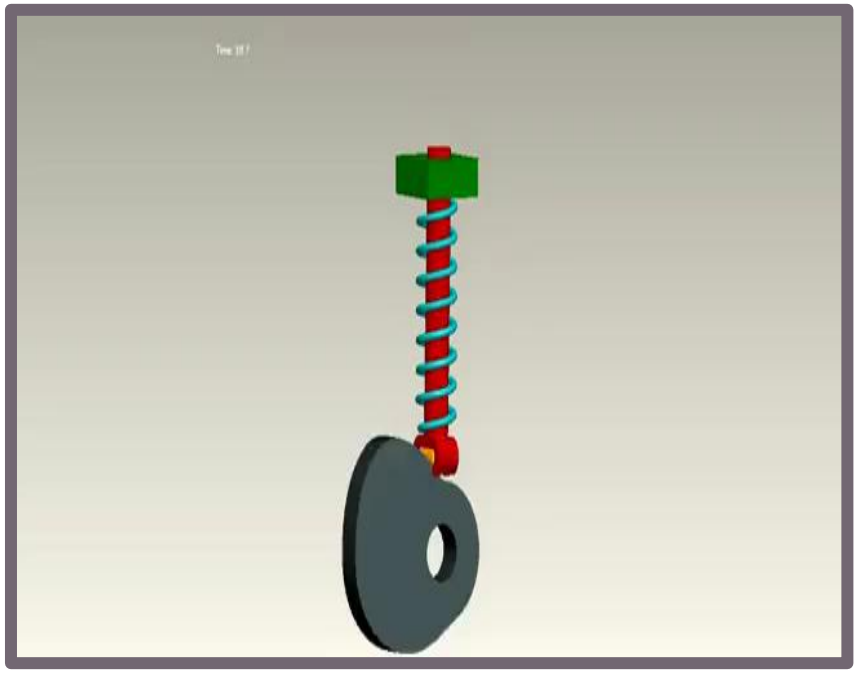


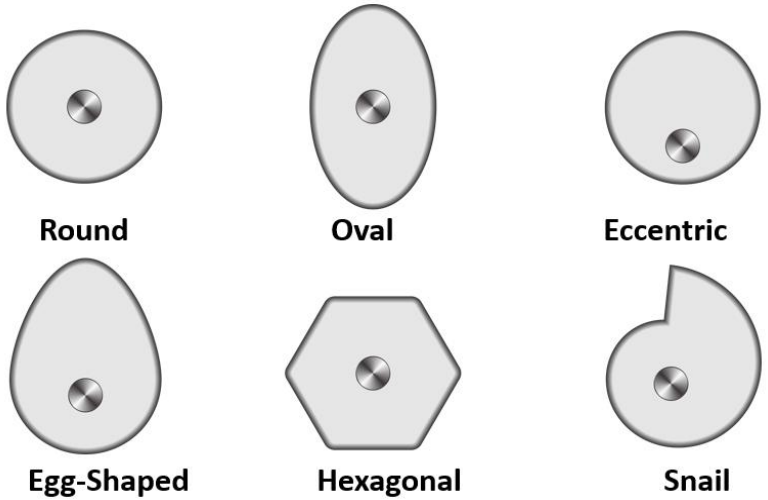
Large Driver: Small Driven
Increases power for climbing hills

MECHANICAL SYSTEM: CAMS

KS2

A cam is a simple mechanism that converts rotary motion (movement that goes round in a circle) into linear motion (movement in a straight line) or vice versa.





A cam is a shaped piece of material (normally wood, plastic or metal). The cam rotates on an axle and the shape of the cam cause different movements.

ONLINE TEACHING RESOURCES

BBC Bitesize: Design Technology

Mechanical systems

What are levers and linkages?

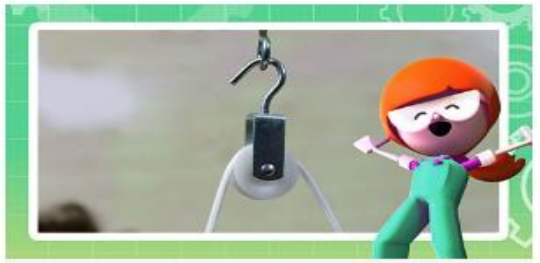
Discover how levers can be combined to make linkages.

What is a hinge mechanism?

Learn about the parts of a hinge and identify different types of hinge.

What is a pneumatic device?

Find out how compressed air or gas can be used in devices.



What are gears and pulleys?

Discover how these two mechanisms can be made and used.

What is a cam mechanism?

Explore how a cam mechanism works and discover the effects of some different cam shapes.

What is a lever mechanism?

Find out how to make your own lever mechanism and discover how it works.

What is a slider mechanism?

Find out about the parts of a slider mechanism and learn how to make one.

What is a wheel and axle mechanism?

Find out how wheels and axles work together to help things move.

Part B: Subject Knowledge: Systems

Electrical Systems

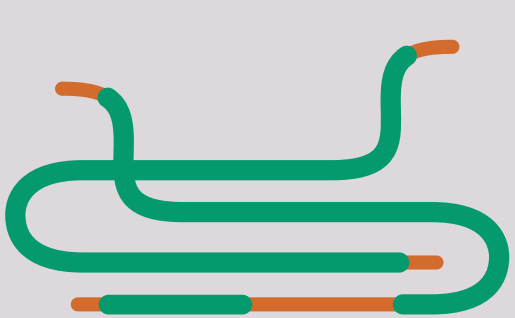
ELECTRICAL SYSTEMS

Input: Switch

Simple Circuit

Output:
Lights
Motor
Buzzer

Children make the system from simple circuit components



wires

battery

switch

light bulb

Children design and make a product that includes a simple circuit

Technical knowledge from science lessons

LKS2

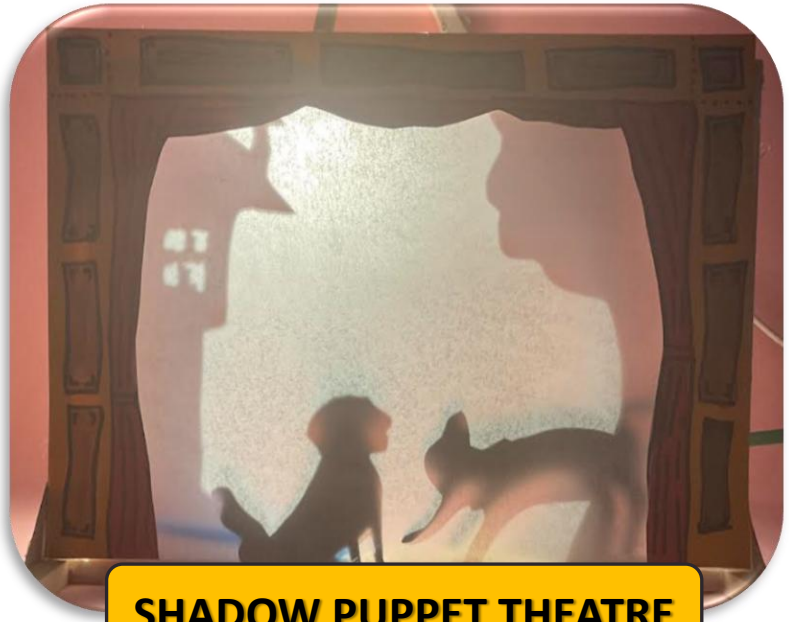
Electrical Systems

For electrical systems, children are applying their knowledge of simple circuits (science NC) to create a product with a simple circuit. Therefore, use the same components.

Battery holders and batteries
Electric wire and wire strippers
Light bulb holder and light bulbs
Assortment of switches
Mini screwdrivers
Buzzers
Motors

Choose the project – design brief and design specifications and buy resources for that. (replenish when needed)

Models do not go home



SHADOW PUPPET THEATRE

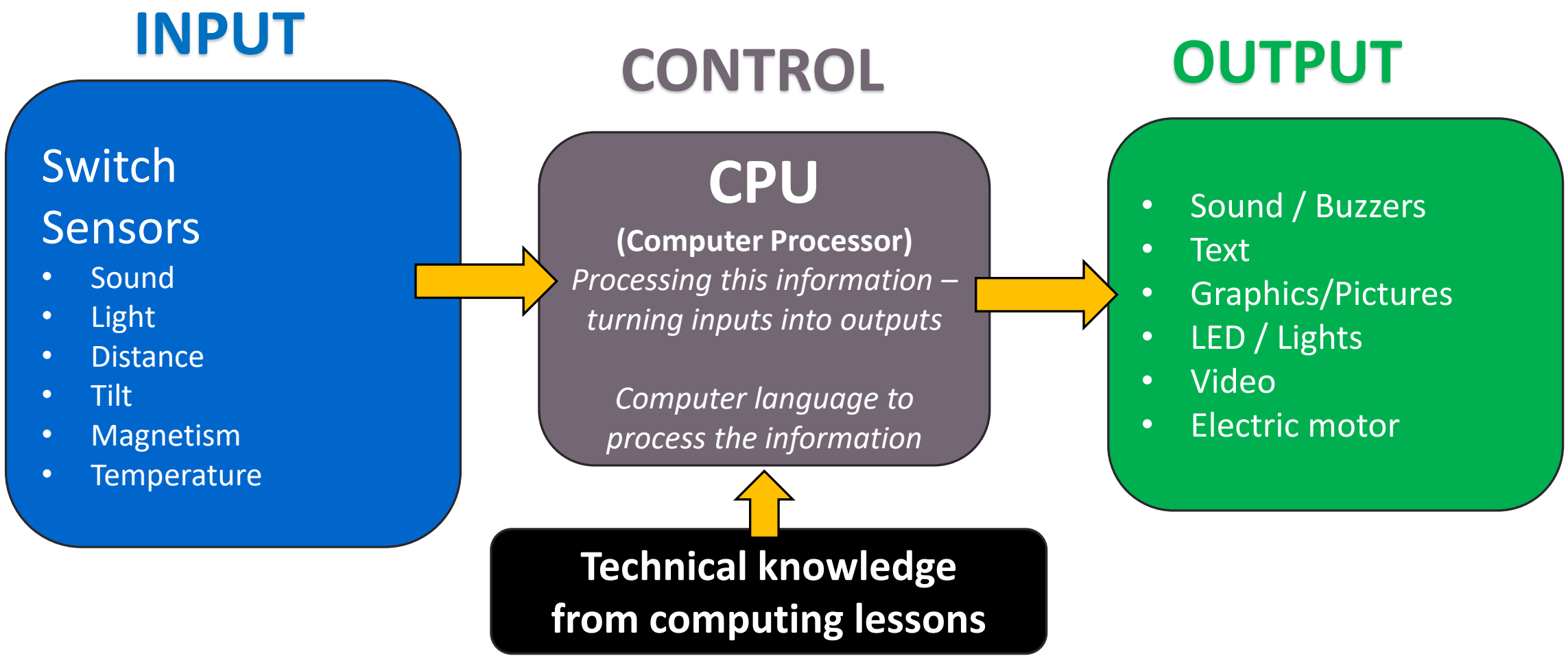
TORCHES

NIGHTLIGHT

Part B: Subject Knowledge: Systems

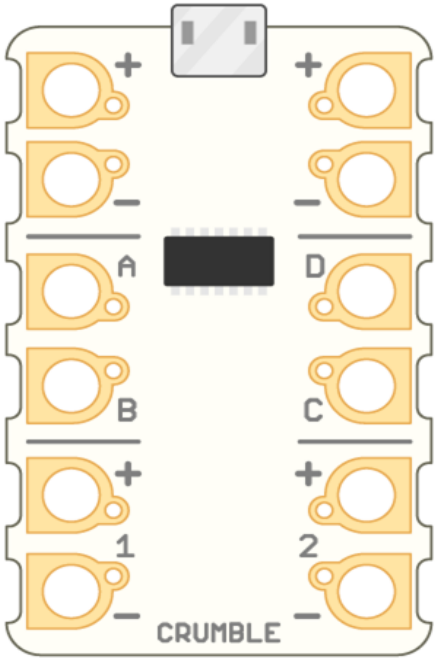
Program Systems

SYSTEM MADE FROM ELECTRONIC COMPONENTS CONTROLLED USING COMPUTER PROGRAMMING



System Components

PROGRAM SYSTEMS

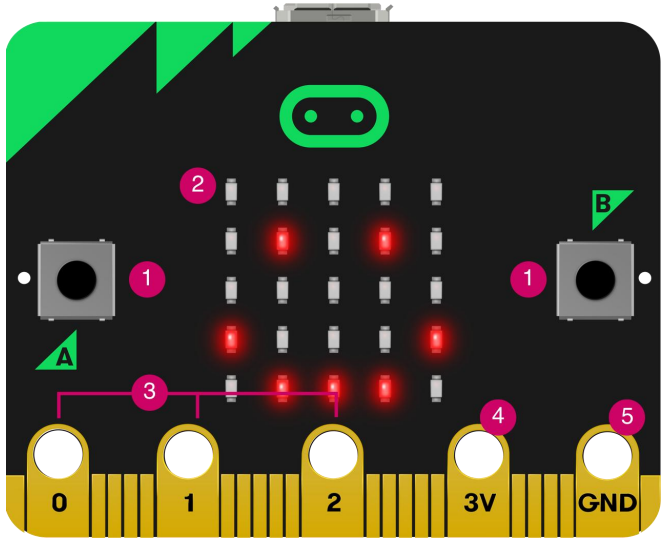


Crumble
microcontroller

SYSTEM CONTROL

A microcontroller is a small device that can be programmed to control components that are connected to it.

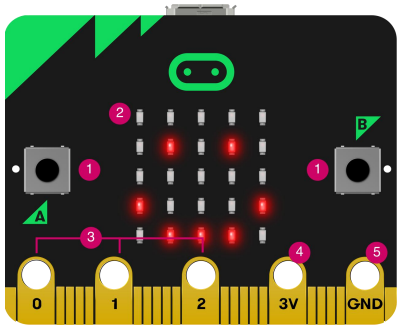
A microcontroller controls outputs and responds to inputs.



Micro:bit
microcontroller

System Components

INPUT



Input components may be included as part of the microcontroller

Light sensor

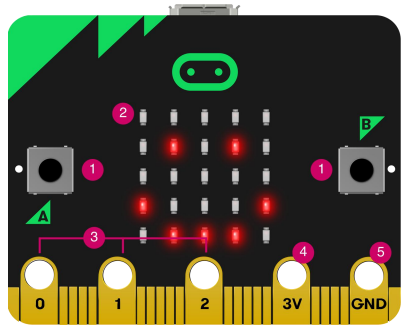
Or as components that are attached to the microcontroller

Light sensor
Sound sensor
Buttons and switches
Temperature sensor
Movement sensors

Switches

Ultrasonic Measuring Sensor

OUTPUT



Output components may be included as part of the microcontroller

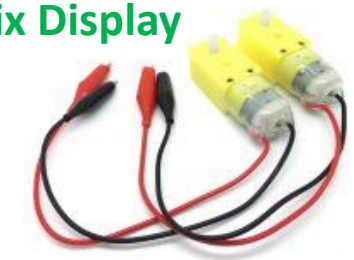
Buzzer

Or as components that are attached to the microcontroller

LED lights

Matrix Display

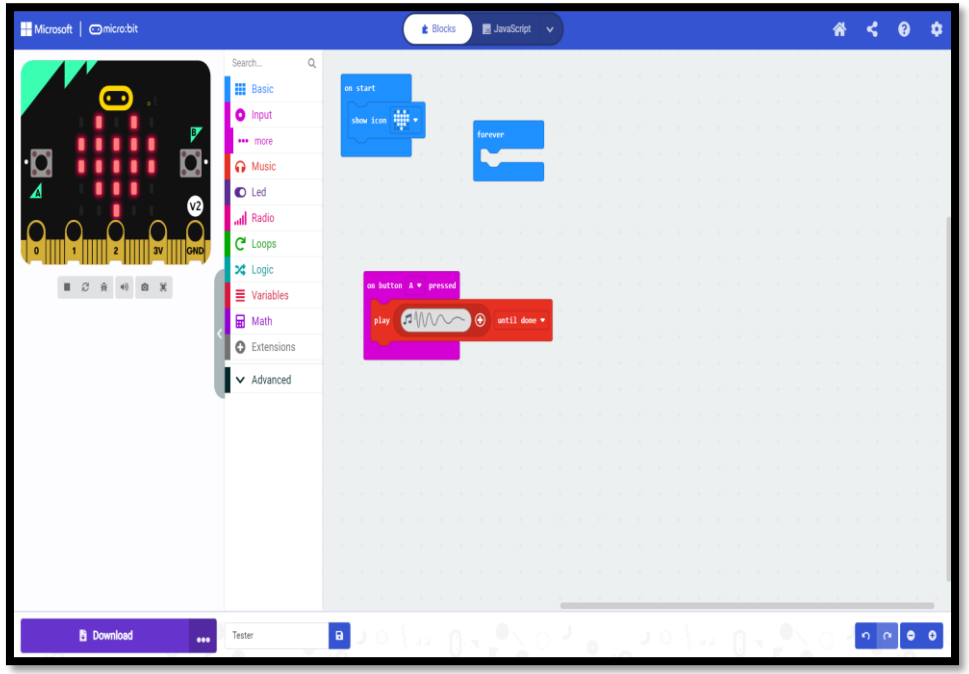
LED light displays
Buzzers and speakers
Motors

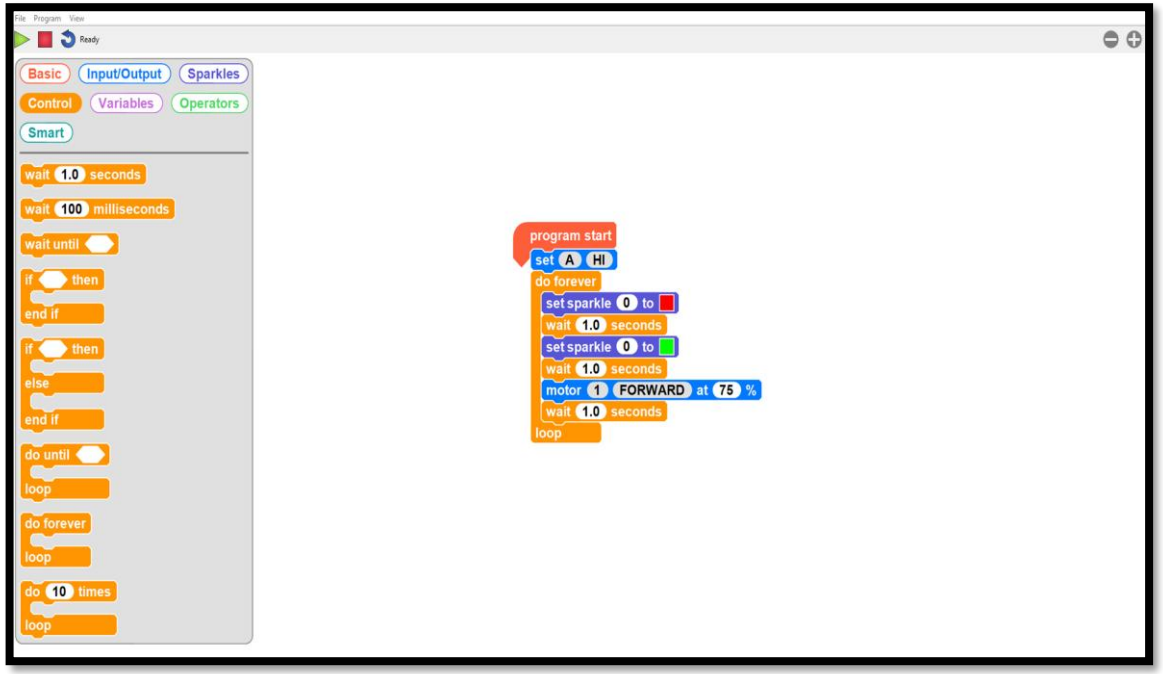


Motors

System Language

PROGRAM SYSTEMS

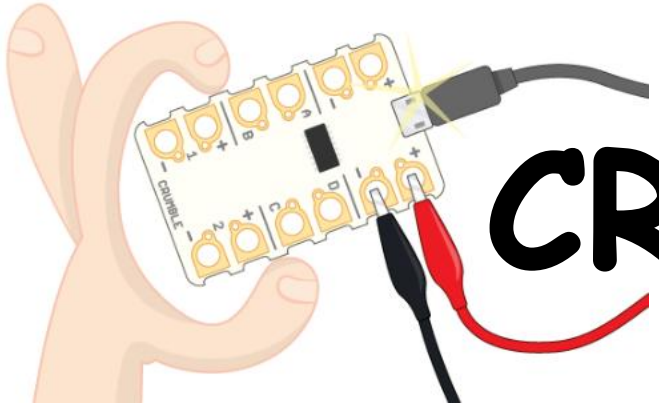




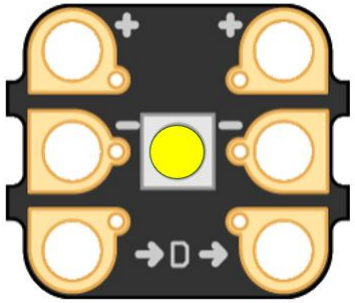
Microsoft Make Code

Crumble Software

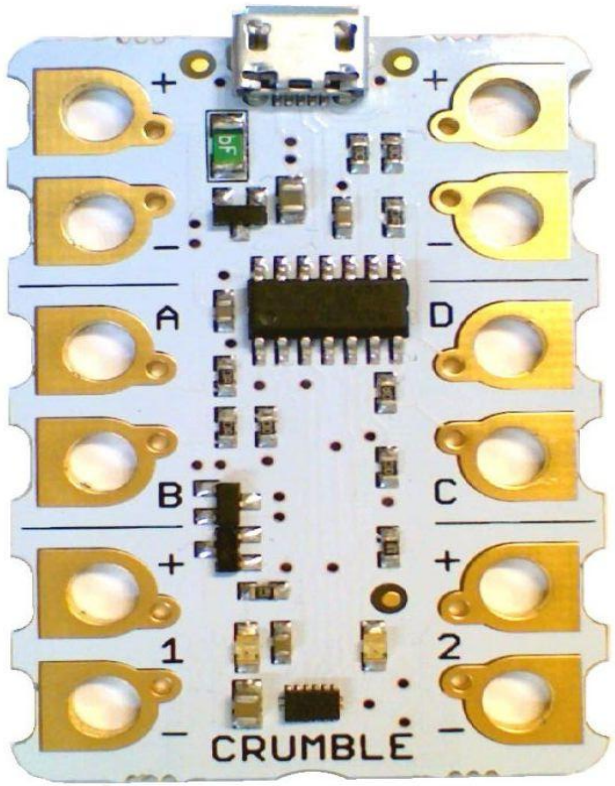
Understand Block Code



CRUMBLE KITS



sparkle

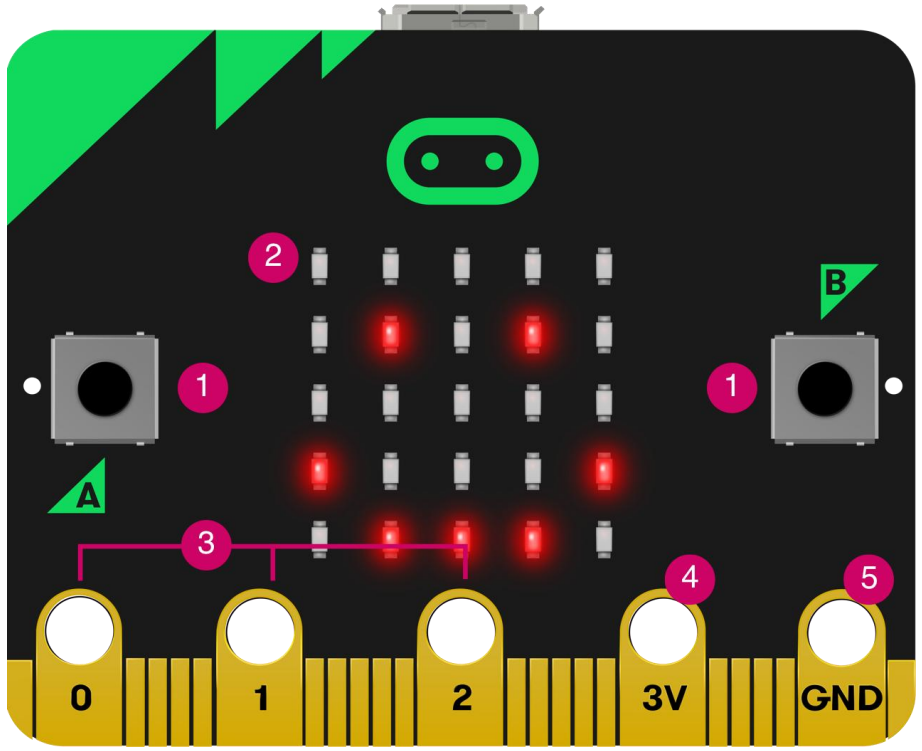


Crumble features

- Free downloadable software
- Programmable RGB lights
- Can attach LED lights
- Light sensor
- Buzzer
- Range of other components
- Connect and control motors
- Servo motors

https://redfernelectronics.co.uk

micro:bit



Micro:bit features

- 25 LED light Square
- Buttons to make things happen
- Microphone
- External pins to add components
- Radio and Bluetooth antenna
- Temperature sensor
- Compass
- Speaker

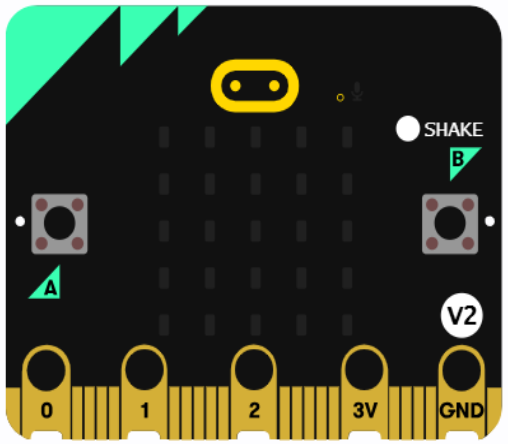
https://microbit.org

PROGRAM SYSTEMS

Microsoft | micro:bit

Blocks | JavaScript

Sign In



Search...

- Basic
- Input
- Music
- Led
- Radio
- Loops
- Logic
- Variables
- Math
- Extensions
- Advanced

```
on start
    show string "Hello - I am Buddy"
    show icon
    pause (ms) 2000
    show string "Do you want to play?"

on button A pressed
    repeat 4 times
    do
        show icon
        pause (ms) 100
        show icon

on shake
    show icon
    play giggle until done
```

Download

Build a Buddy