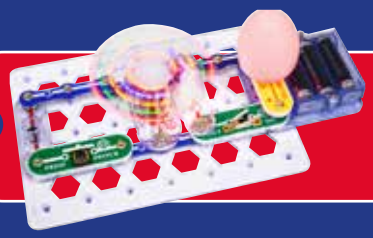


SNAP CIRCUITS®

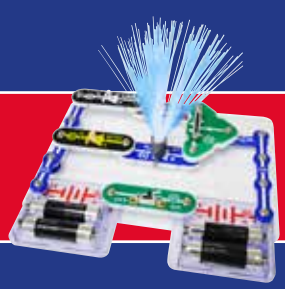
ELENCO®

Available at Rapid Education NOW!
Contact us for a quick & easy quotation.

Prices start as low as **£11.25**

Snap Circuits® teaches basic engineering, electronics and circuitry concepts by using building components with snaps to assemble electronic circuits on a simple "rows-and-columns" base grid. The resulting projects function like the printed circuit board found in most electronic products. Each Snap Circuits® part is easily identifiable by a different color and purpose, and each kit includes an easy-to-follow project manual. The innovative product line offers a wide range of kits, in differing size and complexity, perfect for future engineers ages 8+, with a beginner set designed for kids ages 5+.

The Snap Circuits brand has been endorsed by primary educators globally and used in schools, libraries, museums, afterschool and home schooling programmes, STEAM and Maker clubs. Many of today's rising leaders in science and technology learned the basics of engineering by creating and inventing with Snap Circuits® as a child. Teachers and educators worldwide use Snap Circuits® and its curriculum-rich, full-color manuals to teach kids basic concepts in a fun and exciting way. Educators also applaud Snap Circuits® because it reinforces other important skills, such as small motor skills and reading.



CLEAPSS Member of CLEAPSS

WELCOME ...

To the Design & Technology mailer with a difference.

As we are dedicated to bringing STEAM to life, this publication is packed with projects to do using the kits and products in our Design & Technology range. From making an audio amplifier or moisture tester to using a micro:bit to code a step counter or building your own Arduino, there are enough project ideas to keep students occupied for a whole term or more. Some products are available in class packs giving schools real value for money, while there are useful tips throughout.

Don't forget that we are official partners of Arduino Education and VEX Robotics, so we are able to offer extensive support for these products. Please do not hesitate to contact us for more information.

Plus, for a comprehensive hub of projects and resources related to robotics, 3D printing, science, electronics, art and design and e-textiles, visit **www.rapidonline.com/steam-lab**.

Enjoy the mailer.

Pricing correct at time of going to press and excludes VAT. For up-to-date pricing visit our website.

HOW TO BUILD AN AUDIO AMPLIFIER

KEY STAGE 3

Aimed at Key Stage 3, the Rapid Audio Amplifier Project Kit provides teachers and students with a stimulating and inexpensive project through which to study the subject of amplification. The kits contain a comprehensive selection of components for schools working on audio related projects linked to the National Curriculum.

TASK – BUILDING THE AMPLIFIER

What you have got:

- TBA820M audio amplifier and IC socket
- Resistors, capacitors, LED
- Switch and connecting jack socket
- Connecting cable
- Speaker and speaker cable
- Battery clip

PCBs included in Pack of 20; available separately in packs of 5.

What you will need:

Soldering iron & stand

What you have to do:

1 Solder the resistors in place.
2 Solder the smaller capacitors in place.
3 Solder the electrolytic capacitors into position.
4 Solder the LED in position. Do not forget to leave sufficient room for the LED to protrude from the case you have designed.
5 Solder the IC socket and jack socket into place. This may be a tight fit.
6 Solder the remaining external components in place taking care that if cables need to be fed through a hole in the case you have made sure that you remember to do this.
7 Place the TBA820M in the IC socket.
8 Attach the battery and test the circuit.

Watch our step-by-step video

youtube.com/rapideducationtv

Lesson plans and teacher notes available online!

Class pack £2.51 per student

Audio Amplifier Project Kit Pack of 20 (Includes PCBs)

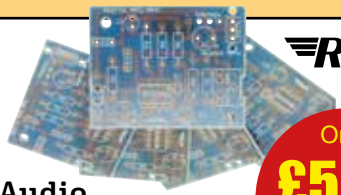
£50.14 Rapid

Order code 13-0106

Only **£9.32** Order code 70-0180

Audio Amplifier Project Kit Pack of 5 (PCBs NOT included)

Rapid



Rapid

Only **£5.89** Order code 70-0190

Audio Amplifier PCB (Pack of 5)

TASK – DESIGNING THE CASE

1 Measure all the separate components that are going to make up your Audio Amplifier e.g. speaker, circuit board, battery, etc. Work out the optimum space needed to contain the circuit.

2 Use a series of sketches to show how the sections of your Audio Amplifer are to be held in your case design.

3 Draw a series of initial ideas for a vacuum formed case to hold the Audio Amplifer circuit. Think carefully about the following:
a. How the circuit is to be held in the case.
b. How much space is required to house the circuit.
c. How to gain access to change the battery.

4 Draw your final design.

HINTS & TIPS

CASING

It is important to avoid damaging your circuit, by securing it into the case properly. You must also be able to change components and batteries.

Feeding a cable through the circuit board and then soldering it in place will help to prevent it being pulled from the board.

ACCESSORIES AND UPGRADES

Economy Mini Side Cutters

- Lap jointed
- PVC handles
- Return spring
- Jaw length 15mm
- Overall length 115mm

Order code	1+	10+	20+	40+
85-0205	£3.45	£2.87	£2.71	£2.55

Solder Wire 60/40 22SWG 0.7mm 500g Reel

- Melting temperature 190°C
- Recommended minimum bit temperature 300°C
- Rosin activated flux manufactured to JISZ3283

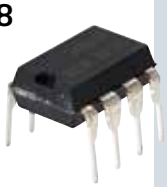
Order code	1+	5+	10+
85-0595	£23.41	£21.30	£20.02

Economy Mini Side Cutters

- Adjustable gauge selector
- PVC handles
- Return spring
- Overall length 130mm

Order code	1+	10+	20+	40+
86-0350	£3.76	£3.32	£2.93	£2.82

Audio Amplifier 1.2W Class B 8 Ohm DIP8



An audio amplifier with a 1.2W output. Intended for use as low frequency Class B power amplifier in portable radios, cassette recorders and players etc.

Order code	1+	10+	25+	100+
82-0485	£0.965	£0.843	£0.768	£0.719

Alkaline PP3 Battery

- Non rechargeable
- Mercury-free
- Cadmium free
- Suitable for a wide range of applications
- Nominal voltage 9V

Order code	MOQ 4+	4+	20+	100+
18-1458		£1.41	£1.25	£1.04

PP3 PCB Battery Holder

- Male and female snap-in terminals assure positive contact and correct polarity
- Moulded from high impact glass filled nylon
- PCB pin terminal
- 9.7mm long, 4mm wide, 14mm high.

Order code	1+	25+	100+
18-2997	£2.09	£1.92	£1.78

Only £11.93 Order code 70-0189

10W Stereo Amplifier With Speakers

- Kit includes PCB and all components to make one stereo amplifier
- Supplied complete with speakers (35-1400) which are 80mm in diameter by 50mm high with 8 ohm impedance
- 10W power per channel
- Stereo connecting cable supplied 3.5mm male to male
- Requires 4 x AA batteries (not included)
- Amplifier dimensions are 50mm width x 75mm length x 30mm height

Stereo Amplifier Kit (Class Pack of 5)

The Stereo Amplifier Kit is a stereo version of our popular Audio Amplifier Project, 70-0180. Once assembled, the amplifier can be connected to MP3 players, laptops or any other device with a 3.5mm headphone jack socket.

Only £19.92 Order code 70-0198

CREATE YOUR OWN MINI-LIGHT

LED key ring light kits designed as an introduction for Key Stage 2 & 3 students to design and make in electronics.

KEY STAGE 2&3

TASK – BUILDING THE MINI-LIGHT

What you have got:

- LED
- Two coin cell batteries
- Plastazote foam square
- Two high impact polystyrene backing sheets
- PCBs included in Pack of 20; available separately in packs of 5.

What you will need:

- Scissors
- Double-sided adhesive tape

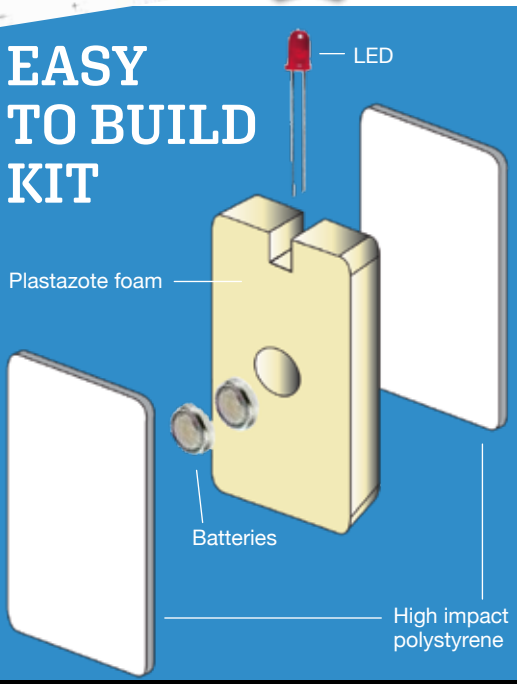
What you have to do:

1. Stick two pieces of the double-side tape to both sides of the backing sheets
2. Attach your template to the two outer sides of the backing sheets
3. Cut around your template, taking care to cut on the waste side
4. Cut a slot for the LED into the plastazote foam
5. Place the coin cells and LED into the plastazote foam
6. Attach one of the backing sheets to the negative side of the plastazote foam
7. Cut the foam roughly to the shape of the template
8. Attach the other backing sheet and cut foam roughly to shape
9. Use abrasive paper to finish the final shape, taking care not to damage the LED
10. Give the finished mini-light a squeeze to test

Watch our step-by-step video

youtube.com/rapideducationtv

EASY TO BUILD KIT



Mini-light Project Classpacks (pack of 20)

Kit includes:

- Batteries and LEDs
- Plastazote foam core
- High impact polystyrene outer layers

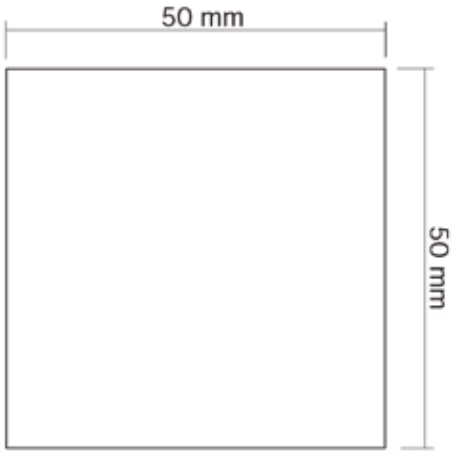
Rapid

RED LED	Order code 13-0138	£13.73
WHITE LED	Order code 13-0155	£17.54
RAINBOW LED	Order code 13-0156	£19.01
ASSORTED LED	Order code 13-0158	£16.57

TASK – DESIGNING YOUR MINI-LIGHT

1 Draw your mini-light template to scale.

2 Do not make your template too complicated with lots of small cut and turns. This will prove difficult for you to cut out.



TASK – PACKAGING ACTIVITY

1 Develop a corporate image for your company to manufacture the Mini-light. You will need to think about the following elements:
- Company name
- Symbol
- Slogan
- Lettering style

2 Draw some ideas and test out different lettering styles for:
- Your company name
- The name of product 'Mini-light'

Mini-light Project (pack of 5) Rapid

RED LED	Order code 70-0015	£2.61
WHITE LED	Order code 70-0012	£4.05
RAINBOW LED	Order code 70-0013	£4.44
ASSORTED LED	Order code 70-0014	£4.96

ACCESSORIES

ultratape

Double Sided Tape 12mm x 33m

- Very high adhesion to metals, plastics, foam and paper
- Supplied on 33m reels

Order code	1+	12+	24+
87-1873	£1.33	£1.22	£1.11

Fret Saw Frame (300mm)

- Supplied fitted with a wood working blade
- Cutting depth: 300mm / 12in.
- Spare blades sold in packs of 12

Type	Order code	1+
Saw frame	86-6546	£9.34
Blade (12)	86-6548	£2.70

Twist & Glue Solvent Free Adhesive 35ml

- Solvent-free
- Clean, clear and refillable
- Washes out at 40°C

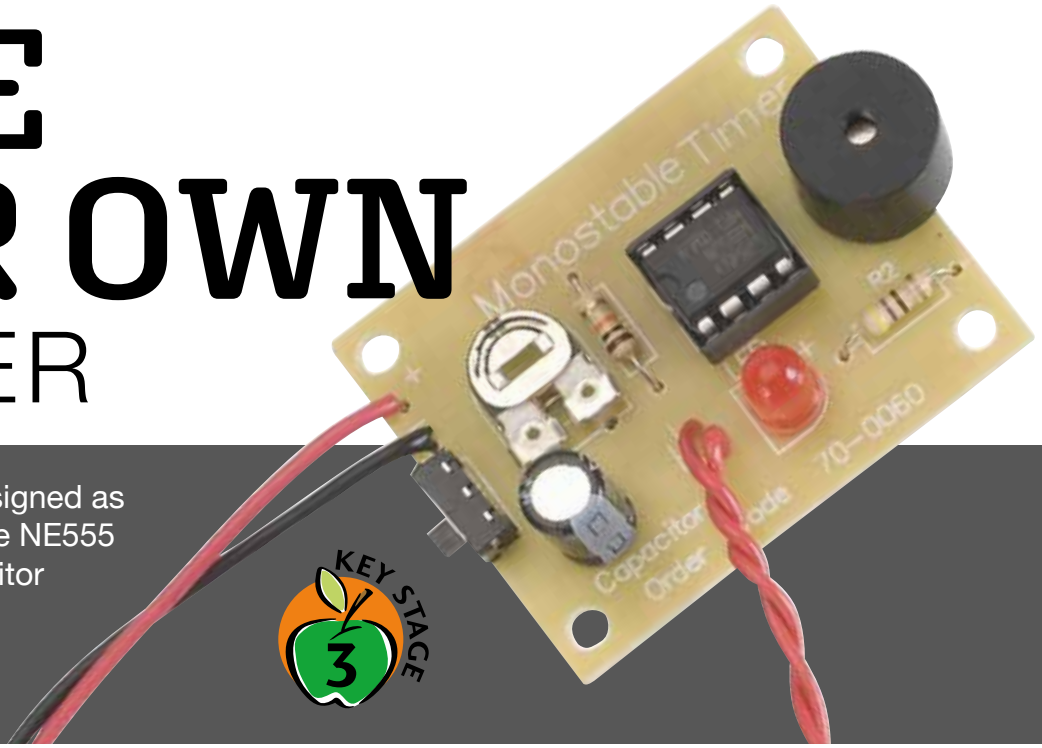
Only **£1.84** Order code 06-7999

Carpenters Pencil Hard Pack of 12

Only **£7.23** Order code 34-7195

- Colour-coded with industry standard colour
- Green:- hard grade for stone and all hard surfaces

MAKE YOUR OWN 555 TIMER



This timer project has been designed as an introduction to the use of the NE555 monostable and resistor-capacitor timing circuits.

KEY STAGE 3

TASK – CONSTRUCTION OF CIRCUIT

What you have got:

- IC ME555, 8 pin IC holder
- R1 10K resistor, R2 470R resistor
- SW1 slide switch, SW2 push-to-make switch
- R3 1M potentiometer, C1 220uF capacitor
- D1 5mm LED
- 12V buzzer
- PP3 battery clip
- PCB (supplied in classpack, available separately in a pack of 5)

What you will need:

- Soldering iron, stand & solder

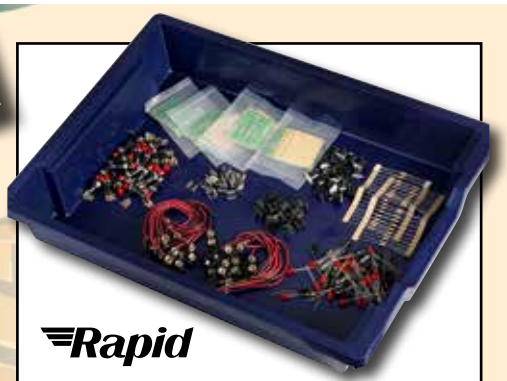
What you have to do:

1 Solder the resistors in place
2 Solder the capacitors in place (making sure you get the legs the correct way round)
3 Solder the LED in position so that it sits 20mm above the circuit board. It is important to connect it the correct way round or it will not light
4 Solder the variable resistor in place
5 Solder the buzzer into the circuit board
6 Solder the IC holder (taking care not to solder between the legs)
7 Solder the slide switch into the circuit board
8 Solder the push-to-make switch onto the wires and then into position on the circuit board
9 Solder the battery clip in place
10 Place the NE555 timer chip into the holder, making sure to insert it the correct way round

Watch our step-by-step video

youtube.com/rapideducationtv

Lesson plans and teacher notes available online!



Rapid

National Curriculum 555 Timer Project Kit in Tray Pack of 20 (Includes PCBs)

£35.43

Order code 13-0104

Only **£8.67** Order code 70-0050

555 Timer Project Kit Pack of 5 (PCBs NOT included)

Rapid

Rapid

Only **£3.60** Order code 70-0060

Timer Project PCBs (Pack of 5)

TASK – TIMER INVESTIGATION: BOARD GAMES

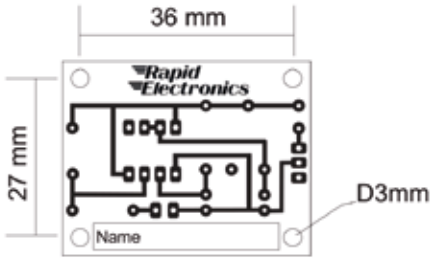
Collect together a range of board games (try to select those that use a timer). Working in groups of four, play the games for about ten minutes and then use the following questions to help you evaluate the games.

QUESTIONS

- What age group do you think the game is intended for? How can you tell?
- What is the maximum and minimum number of players that the game is designed for?
- How does a player progress around the board? Give a brief description of the process. Explain how a player wins the game.
- How easy were the instructions to follow? Were there any sections you did not understand?
- How well was the game packaged? Were all the pieces stored carefully? What did you think of the graphics displayed on the box? Was your attention drawn to the package and why?
- What is the time interval each contestant has to answer the question?

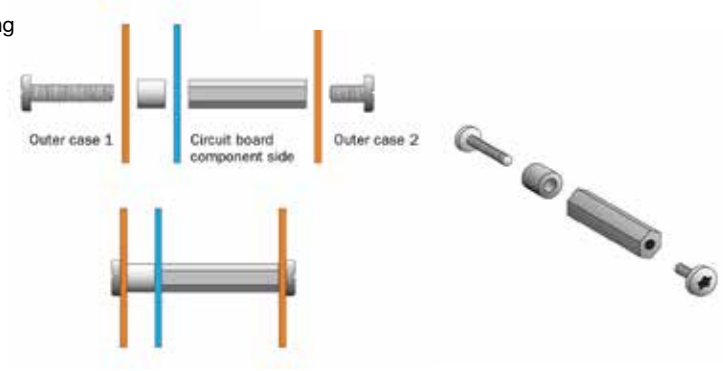
TASK – BUILDING A CASE FOR YOUR TIMER

The diagram below shows the position of the location holes needed to cover the battery and circuit.



Procedure for production

1. Attach the two pieces of outer case material together using double-sided tape.
2. Attach your design template.
3. Cut around the template of the design taking care to ensure that you have left sufficient material to cover the circuit board and the battery that will be placed behind it.
4. Smooth the edges by filing, and with glasspaper.
5. Place the circuit board onto the outline shape and drill through the four marked holes with a 3mm drill. Take care not to damage the circuit board whilst you are doing this.
6. Separate the two sides of the case.
7. Mark and drill a 7mm diameter hole in the front panel of the case for mounting the push-to-make switch.
8. Solder the components into the circuit board.
9. Assemble case and circuit board using the spacers.



The circuit will require four spacer arrangements to ensure the circuit board is held securely in place.

Each student will require the following:

- 4 of M3 6mm pan head slotted screws (33-1500)
- 4 of M3 12 mm pan head slotted screws (33-1510)
- 4 of M3 spacer 4mm (33-3611)
- 4 of 18mm threaded spacers (33-3535)

CREATE YOUR OWN Moisture Tester

KEY STAGE 2&3

Build a simple and functional Moisture Tester that can tell if pot plants require water. The classpack of 20 kits contains all the electronic components required, including ready-made PCBs, in a Gratnell's tray with lid. A pack of 5 kits is also available, including just the components, with the opportunity to make your own PCB board from scratch.

TASK – CONSTRUCTION OF CIRCUIT
USING PRE-MADE PCB BOARD

What you have got:

- PCB board pre-drilled
- BC548B transistor
- R2 1K resistor & R3 1K2 resistor
- R1 470R resistor
- 5mm Red LED
- Battery clip

What you will need:

- Soldering iron, solder wire & helping hands assembly aid
- Side cutters
- PP3 battery

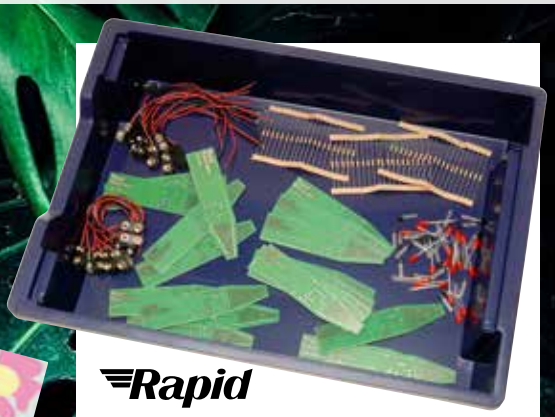
What you have to do:

1. Solder the three resistors in place (care should be taken not to overheat the copper track or it will lift from the circuit board).
2. Solder the transistor in place (making sure you get the legs the correct way round).
3. Solder the LED in position so that it sits 20mm above the circuit board. It is important to connect it the correct way round or it will not light.
4. Solder the battery clip in place. Take care when shortening the connecting wires.
5. Use an elastic band to hold the battery in place
6. Put your Moisture tester to the test!

Watch our step-by-step video

youtube.com/rapideducationtv

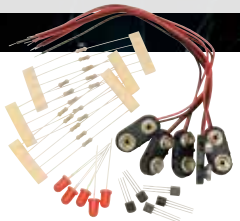
Lesson plans and teacher notes available online!



Rapid

Moisture Tester Project Kit- Pack of 20 (Includes PCBs)

£20.60
Order code 13-0102



Only **£1.40** Order code 70-0030

Moisture Tester Project Kit Pack of 5 (PCBs NOT included)

Rapid

Rapid

Only **£4.76** Order code 70-0040

Moisture Tester PCBs (Pack of 5)

TASK – CONSTRUCTION OF CIRCUIT
MAKING YOUR OWN PCB BOARD

What you have got:

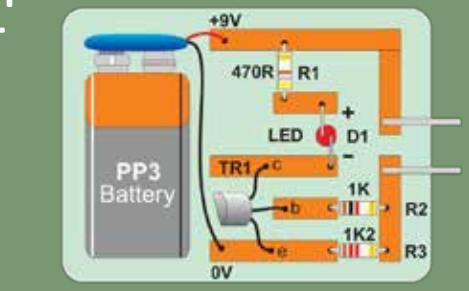
- BC548B transistor
- R2 1K resistor & R3 1K2 resistor
- R1 470R resistor
- 5mm Red LED
- Battery clip

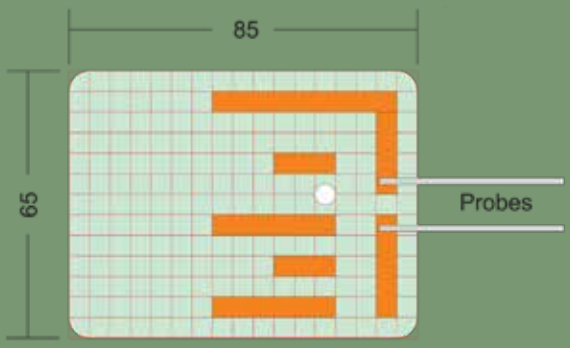
What you will need:

- Soldering iron, solder wire & helping hands assembly aid
- Blank card to build circuit on
- Two paper clips (for moisture probes)
- 300mm of adhesive copper track
- Side cutters
- PP3 battery

What you have to do:

1. Mark out and stick the copper tracks to the card background.
2. Cut the hole for the LED to pass through (taking care not to make the hole too large).
3. Solder the three resistors in place (care should be taken not to overheat the copper track or it will lift from the card base).
4. Solder the transistor in place (making sure you get the legs the correct way round).
5. Solder the probes in place.
6. Solder the battery clip in place. Take care when shortening the connecting wires.
7. Solder the LED in position. It is important to connect it the correct way round or it will not light.
8. Use an elastic band to hold the battery in place
9. Put your Moisture tester to the test!



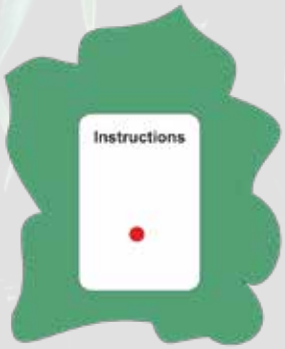


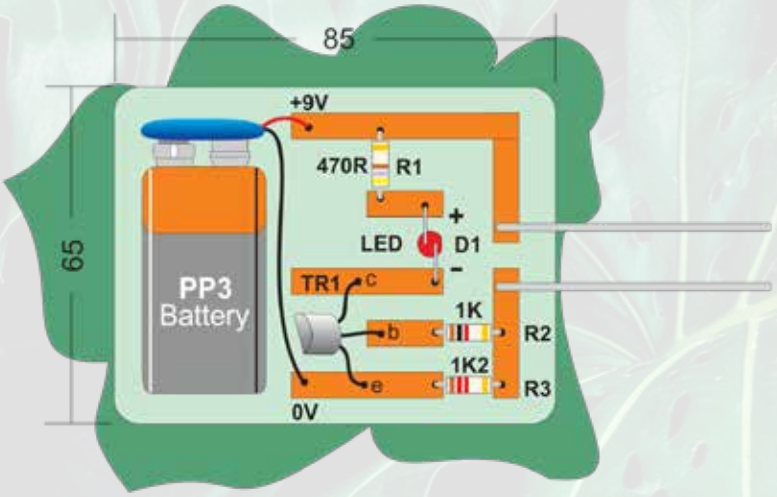
TASK – FINAL DESIGN & INSTRUCTIONS

Develop a final design. Make sure the design covers the circuit board and that it does not prevent the probes being placed in the soil. Remember to include the position of the LED.

Develop a series of instructions on how to use the moisture sensor, to be included on the front of the final design.
Include the following sections:

- How to place the probes correctly in the soil.
- How to measure the moisture content.
- How to adjust the sensitivity of the sensor.





ACCESSORIES

Copper Foil Adhesive Tape 5mm x 50m

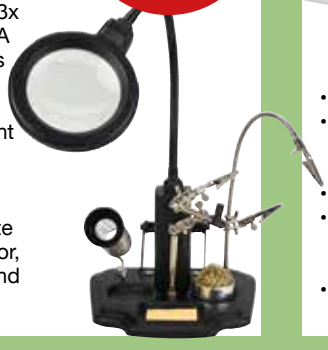
- 5mm width
- Self-adhesive backing
- Ideal for one-offs and prototyping
- Supplied on 50 metre reels

Order code	1+	10+
34-0636	£7.41	£6.55

LED Magnifying Lamp With Helping Hands

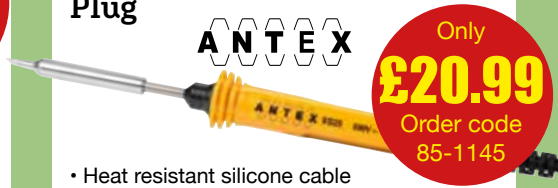
Only **£43.32** Order code 85-5928

- Lens dia. 90mm
- Main lens power 3x
- Powered by 4x AA batteries or mains adaptor
- Height approx. 300mm dependent on angle of lens
- Metal base for stability
- Supplied complete with mains adaptor, wire tip cleaner and sponge



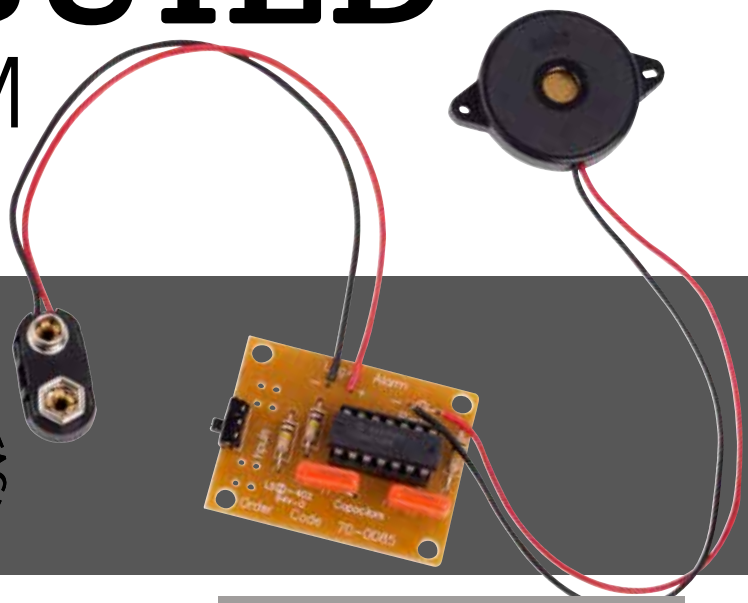
XS25W Soldering Iron 230V with Silicone Cable and 13A Plug

Only **£20.99** Order code 85-1145



- Heat resistant silicone cable
- Inner ceramic shaft provides near-perfect insulation with virtually no leakage (3 to 5µA)
- Outer stainless steel shaft for strength
- Bits are held on the element shaft by an internal spring clip and simply slide on or off for changing
- Supplied complete with 2.3mm bit and mains cable

HOW TO BUILD
A LOGIC ALARM



The Logic Alarm project is an ideal way to introduce students to logic circuit theory, logic gates, truth tables and the design of combination circuits.

KEY STAGE 3&4

TASK – CONSTRUCTION OF CIRCUIT

What you have got:

- IC 4093 & 14 pin IC holder
- Three 100K resistors
- Ultra-miniature slide switch
- Two 15nF capacitors
- Piezo sounder
- Battery clip

Lesson plans and teacher notes available online!

What you will need:

- PCB board (available separately in packs of 5)
- Soldering iron, solder wire & helping hands assembly aid
- Push button switch
- Side cutters
- Equipment wire
- Wire strippers
- PP3 battery

What you have to do:

1. Solder the resistors in place.
2. Solder the capacitors in place.
3. Solder the piezo sounder onto the circuit board.
4. Solder the switch onto the circuit board.
5. Solder the IC holder in place.
6. Solder the battery clip in place.
7. Connect your method of triggering the alarm to the circuit, taking care to use the correct set of pads.
8. Place the 4093 chip into the holder, making sure to insert it the correct way round.

Watch our step-by-step video

youtube.com/rapideducationtv

TASK – CASE DESIGN

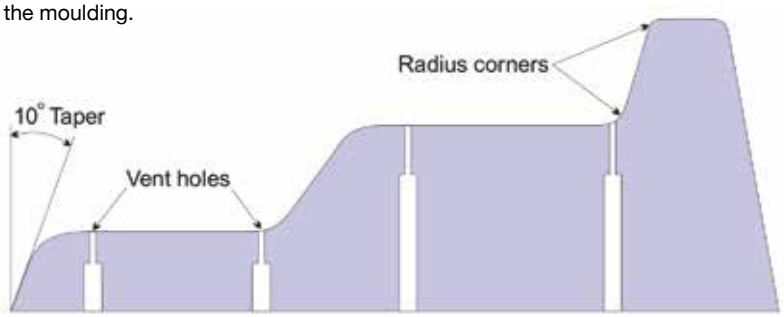
1. Measure all the separate components that are going to make up your Logic Alarm e.g. switch, circuit board, battery, etc. Work out the optimum space needed to contain the circuit.
2. Draw a series of initial ideas for a vacuum formed case to hold the Logic Alarm. Think carefully about the following:
   a. How the circuit is to be held in the case.
   b. How much space is required to house the circuit.
   c. How to gain access to change the battery.
   Present your ideas as a series of sketch ideas, highlighting those you feel are the most interesting with colour.
3. Use the Rapid website to select a suitable case for your Logic Alarm circuit giving reasons for your selection.

There are a variety of methods of containing your electronic products. The choice will depend on your design requirements.

Vacuum forming is an ideal method for creating cases to hold your electronic products. High impact Polystyrene or ABS make good case moulding materials. The first stage is to design and make a mould.

There are a number of important features that need to be included to make a good mould design:

1. The mould sides must be tapered to allow the mould to be removed.
2. Vent holes need to be drilled to help draw the plastic when the vacuum is created.
3. There should be no undercuts, which will prevent the moulding being removed from the mould.
4. The mould needs a high standard of finish. Any marks will appear on the surface of the moulding.



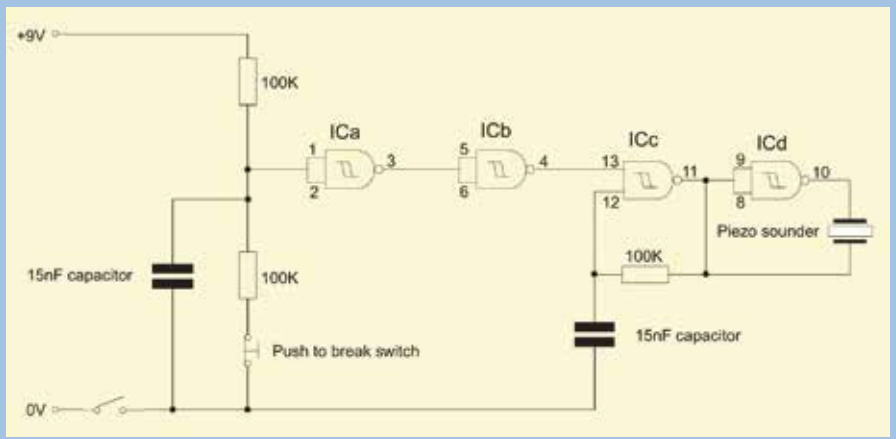
Mayku FormBox Desktop Vacuum Forming Machine

The FormBox has the same footprint as an average laptop and is at least 5 times cheaper than its industrial cousins. It has been thoroughly safety tested and is recommended for use by children aged 8+. **See page ?? for more details.**

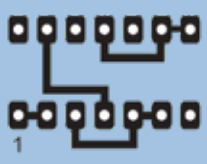
Only **£479.00** Order code 70-0021

TASK – PCB DESIGN

The circuit diagram below is for the logic alarm. Use this diagram to help you complete the PCB circuit layout.



1. Start by positioning the IC
2. Make the connections between the pins of the IC
3. Then place the other components, remembering to try and group inputs and outputs
4. Your aim should be to produce a design that allows for easy placement and soldering of components whilst being economical in your use of the PCB



ACCESSORIES

Miniature Red Push to Make Switch

- Rated 125V AC 250mA
- Panel cut-out 7mm
- Dimensions 28mm long, Ø10.5mm

Order code	MOQ 10+	10+	100+	500+
78-0100		£0.231	£0.197	£0.181

Equipment Wire Single Core 1/0.6 Black (Reel of 100m)

Order code	1+	10+
01-0300	£7.98	£7.01

RED Low Cost Side Cutters + Wire Guard

Order code	1+	10+	20+	40+
86-0210	£3.97	£3.59	£3.28	£3.07

2.5W Stereo Amplifier Kit Without Speakers

- Kit includes PCB and all components to make one stereo amplifier
- 2.5W power per channel
- Connecting cable supplied
- Supplied without speakers
- Requires 4x AA batteries (not included)

Order code	1+	20+
70-0186	**£6.65**	**£5.14**

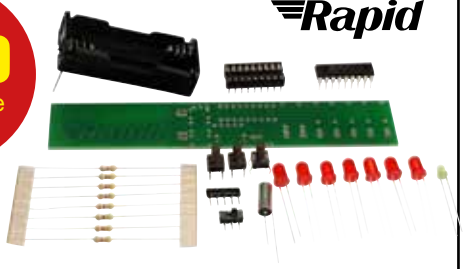
10W Stereo Amplifier Kit Without Speakers

- Kit includes PCB and all components to make one stereo amplifier
- Supplied without speakers
- 10W power per channel
- Stereo connecting cable supplied 3.5mm male to male
- Requires 4 x AA batteries (not included)
- Amplifier dimensions are 50mm width x 75mm length x 30mm height

Only **£7.56** Order code 70-0188

POV Wand Project Kit

Only **£6.29** Order code 70-2555



- Programmable – create your own messages up to 6 characters long
- 57 pre-defined characters
- Complete set of components including printed circuit board
- Ideal demonstration of PIC controlled electronics and construction
- Component count 25
- Suitable for Key Stages 2, 3 & 4 (ages 7 to 16)

Spare PCB for Pov Wand Project Kit

MOQ 2+ **£0.641** Order code 70-2556

A ready made printed circuit board for the POV Wand Project, 70-2555.

- Supplied singly

Temperature Sensor Kit Pack of 10

This general-purpose temperature-sensing circuit uses a thermistor to detect changes in temperature and switches the LED on or off accordingly. The sensitivity of the circuit can be set by adjusting a potentiometer.

- Pack contains:
  - 10x PCB
  - 10x BC548 transistor
  - 10x thermistor (1kΩ)
  - 10x 1kΩ resistor
  - 10x 3.3kΩ resistor
  - 10x 470Ω resistor
  - 10x standard LED
  - 10x 10kΩ potentiometer
  - 10x battery connector
- Designed for use with a 3 to 9V supply

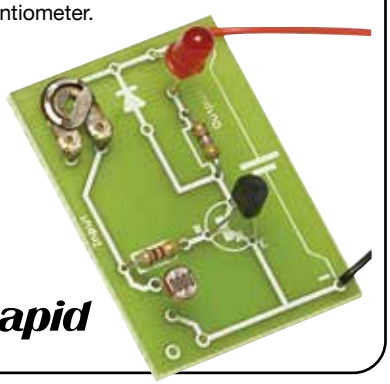
Only **£9.94** Order code 06-1582

Light Sensor Kit Pack of 10

Only **£9.94** Order code 06-1581

The general-purpose light-sensing circuit uses a miniature light dependent resistor (LDR) to detect changes in the level of light and switches the LED on or off accordingly. The sensitivity of the circuit can be set by adjusting a potentiometer.

- Pack contains:
  - 10x PCB
  - 10x BC548 transistor
  - 10x mini-LDR
  - 10x 1kΩ resistor
  - 10x 100Ω resistor
  - 10x 470Ω resistor
  - 10x standard LED
  - 10x 47kΩ potentiometer
  - 10x battery connector
- Designed for use with a 3 to 9V supply

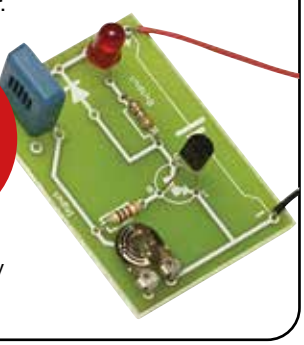


Humidity Sensor Kit Pack of 10

This general-purpose circuit detects changes in humidity and switches the LED on or off accordingly. The sensitivity of the circuit can be set by adjusting a potentiometer.

- Pack contains:
  - 10x PCB
  - 10x BC548 transistor
  - 10x humidity sensor
  - 10x 1kΩ resistor
  - 10x 100Ω resistor
  - 10x 470Ω resistor
  - 10x standard LED
  - 10x 5kΩ potentiometer
  - 10x battery connector
- Designed for use with a 6 to 9V supply

Only **£14.75** Order code 06-1583



10W Stereo Amplifier With Speakers

This stereo audio amplifier kit gives you more power and more volume than our standard kits. Each channel can deliver up to 10W for a louder, crisper sound. The kit is supplied complete with speakers. Supplied with assembly instructions.

Only **£11.93** Order code 70-0189

555 timer Astable/ monostable Project Pack of 5

Only **£9.44** Order code 70-0225

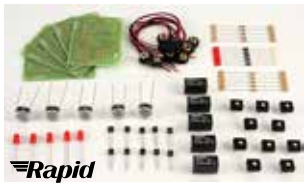
- The kit is a timing circuit, which can be used to switch devices or circuits on and off
- All components, including the PCBs, are provided (batteries not included)

LDR PCB Project Kit Pack of 5

Only **£23.91** Order code 70-0245

- The kit is a light sensing circuit, which can be used to switch output devices or circuits on and off
- The kit includes: resistors and diodes, transistors and preset resistors, LEDs and relays, LDR PCB and PP3 battery clip

Thermistor Temperature Sensor Project Kit - Pack of 5



Only **£13.78** Order code 70-0315

- The kit is a heat sensing circuit, which can be set to recognise various temperatures through the use of a variable resistance
- The kit includes: resistors, amplifier IC sockets, diodes, thermistors, preset resistors, transistors, LEDs, thermistor PCB and PP3 battery clip

Nightlight Kit Pack of 5

Only **£10.95** Order code 70-2600

- An excellent platform for creative product design
- Featured in Electronics Education published by the IEE
- Can be used to explore timing circuits using different component values

Electronic Components Spares Kit

Only **£63.55** Order code 13-0108

- The kit is ideal for the classroom and contains LEDs, resistors, capacitors, etc.
- Total number of components = 1945

Wire Starter Pack

Only **£39.00** Order code 13-0112

- Contains wire cutters and strippers, wire, batteries and battery clips
- Offers a massive saving over separately purchased items

Mini-light Kit Assorted Class Pack

Only **£16.57** Order code 13-0158

Assorted classpack of 20, contains 5 of each type: Standard, Super-bright, Rainbow and Ultraviolet .

LED Pack

Only **£45.40** Order code 13-0122

- Offers a significant saving over separately bought items
- Total number of components = 680

Electricity Class Pack

Only **£40.51** Order code 70-1012

- Cost saving over buying parts separately
- Popular parts can be topped up
- Packed in a Gratnells storage tray with lid

Time to be creative

Clock Group Kit

- Kit contains 10x wooden clock blanks, 10x clock mechanisms, 10x numeral sets and 100 sheets of A4 white card
- Clock blanks 170 x 170mm

Only **£25.00** Order code 13-0152

REACTION GAME

micro:bit PROJECT

Make a reaction game with real physical switches you can bash as hard as you like!

BBC micro:bit

TASK 1 – MAKE IT

How it works

- Make two physical input switches using cardboard and tin foil – similar to the ones used in the Pressure switch alarm project.
- Connect them to the micro:bit pins as in the picture – one tin foil pad on each switch goes to the micro:bit's GND pin, and the other is connected to pin 1 or pin 2 depending on whether you are player A or player B.
- The program waits a random time between 1 and 5 seconds, then shows a heart on the LED display output.
- You can't hit your button before it lights because it uses Boolean logic to stop anyone cheating! Boolean variables can only have two values: True or False. The game started variable prevents either player pressing their button too soon by only checking which button is pressed while the game has started.
- An infinite loop keeps the game running so you can keep playing.

What you need

- 1 micro:bit
- 4 crocodile clip leads
- Some scrap cardboard, tin foil, glue and scissors

TASK 3 – IMPROVE IT

- Use variables to keep track of each player's score
- Add a timer to show how quick each winner's reaction was
- Track which player has the fastest reaction time

TASK 2 – CODE IT

STEP COUNTER

micro:bit PROJECT

Turn your micro:bit into a step counter (or pedometer) to help you track how active you are - and learn some coding at the same time!

TASK 1 – MAKE IT

How it works

- Like the Dice project this program uses the micro:bit's accelerometer to make something happen.
- It counts how many times the micro:bit has been shaken. It stores this number in a variable called 'steps'.
- Variables are used by computers to store information that may change, such as the number of steps you've taken.
- Every time the micro:bit accelerometer input senses a shake, the program increases the variable by 1, and shows the new number on the LED display output.

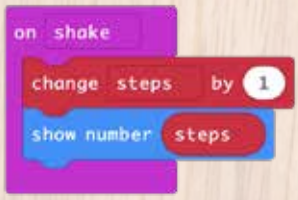
What you need

- micro:bit (or MakeCode simulator)
- MakeCode or Python editor
- battery pack (optional)
- something to attach the micro:bit to your shoe or leg – string, tape or hook & loop.

These two videos show you what you'll make and how to code it:

To watch these videos, please view our micro:bit playlist:
Youtube/rapideducationtv

TASK 2 – CODE IT

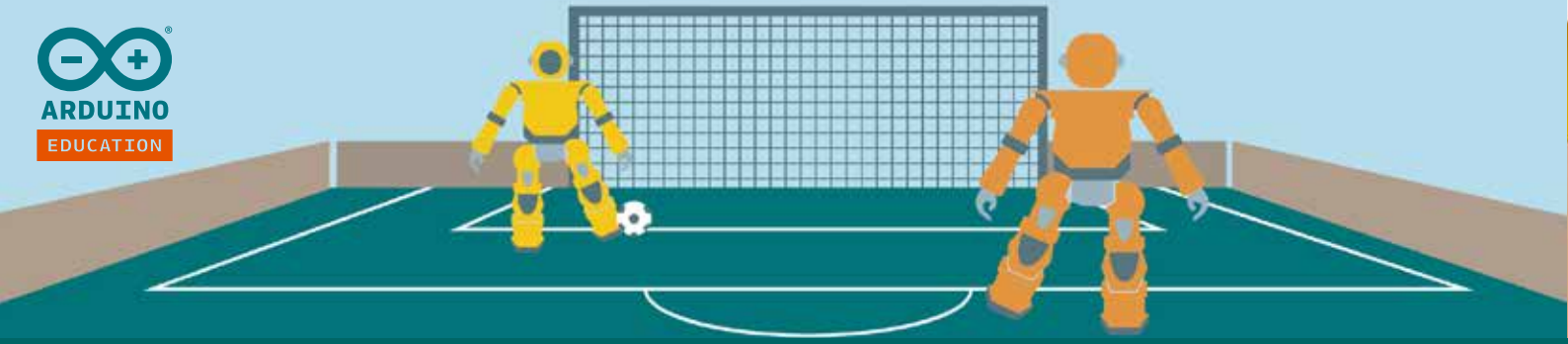


TASK 3 – IMPROVE IT

- Add a button to reset the steps to 0.
- Add a graphical representation of how many steps you've taken.
- Measure the length of your average step and get your micro:bit to multiply this by the number of steps to calculate the distance you've walked.

SPORTS ROBOT

ARDUINO PROJECT



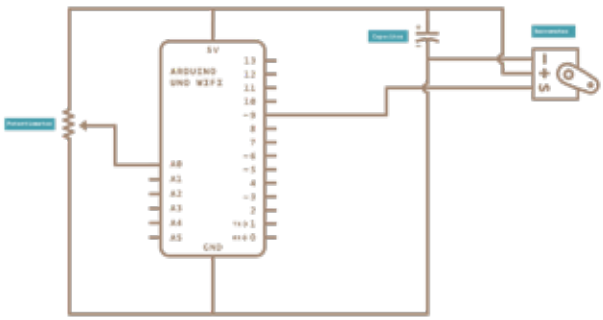
By using a servo motor, you will be able to create a simple sports robot.

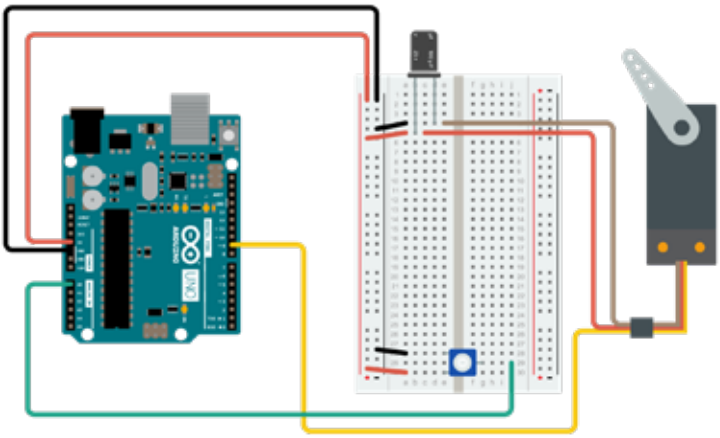
At the end, the robot should be able to hit, kick or throw a ball. You will also be able to experiment and test your robot's abilities.

KEY STAGE 3

TASK – BUILD THE CIRCUIT

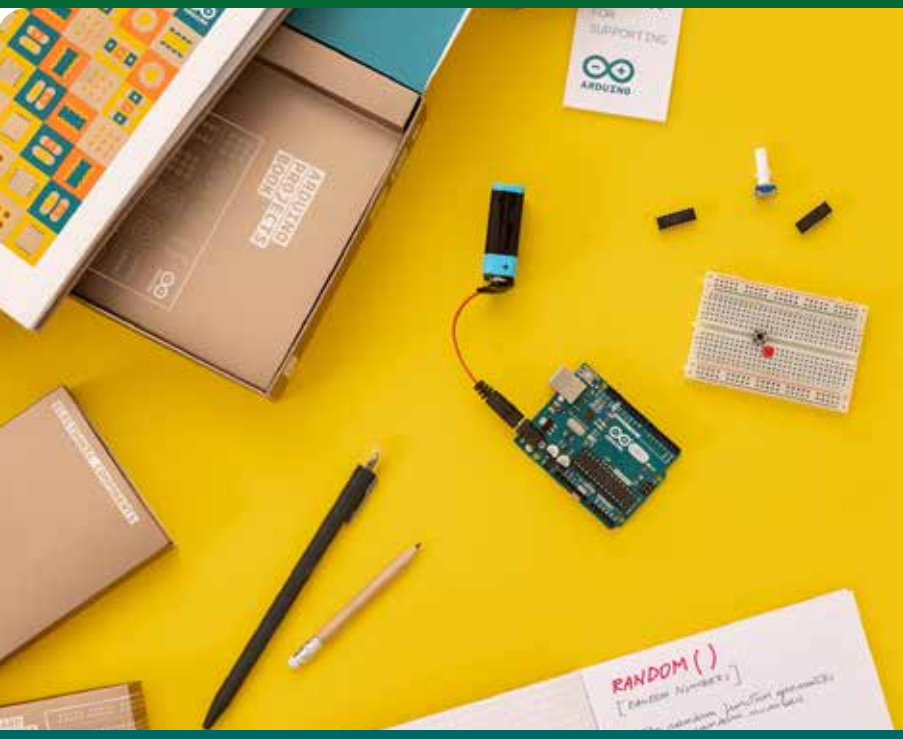
Follow the following wiring diagram to build the circuit.





TASK – CODE CREATION

In this step you upload (or write) a sketch that enables you to control the angle of the servo by turning the potentiometer



ARDUINO EDUCATION

DID YOU KNOW WE ARE ARDUINO'S EDUCATION PARTNER IN THE UK?

By working together it is the aim of Arduino and Rapid to bring integrated STEAM solutions to schools. Providing rich content and resources, we will ensure that teachers have everything they need to implement STEAM subjects in their school.

IF YOU WANT TO TEST AND MODIFY YOUR SPORTS ROBOT ABILITIES, YOU CAN CHECK OUT LESSON 6 OF THE ARDUINO STUDENT KIT CONTENT. ENJOY!

Design and Technology UK curriculum alignment

The Arduino Student Kit provides an interesting hands-on way to educate students about design, technology and making. The English National Curriculum states that students at 11 to 14 years of age (key stage 3) 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 domestic and local contexts, and industrial contexts, for example, engineering, manufacturing, and construction."*

UK Curriculum Key stage 3 and Student Kit:

	English National Curriculum	Student Kit
DESIGN	Identify and solve their own design problems and understand how to reformulate problems given to them.	Two open-ended projects allow students to design and develop their own kind of solution to a given real-world example or problem. While making the project students use a Logbook which includes a template to plan and document each phase of their project, from ideas, pseudocode to demonstration and scoring. Students are encouraged to present their projects to others to learn more how to communicate their ideas and learn how others have solved the same problem in different ways.
	Develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations, and computer-based tools.	
MAKE	Select from and use specialist tools, techniques, processes, equipment, and machinery precisely, including computer-aided manufacture.	When building the circuits and creating the programs students are using tools, such as Arduino, IDE and text-based programming languages that are commonly used in industries and possibly in their future careers.
EVALUATE	Analyse the work of past and present professionals and others to develop and broaden their understanding.	In the Invention Spotlight, students learn about different inventions and inventors. They will get a broader view and historical insight and better understanding of how technology has evolved over time and how different inventions have affected how we live, communicate or move things in the present days.
	Understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists.	
TECHNICAL KNOWLEDGE	Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs].	In the lessons and projects students build circuits using common electronic components. They learn to program microcontroller boards, sense light and temperature using different sensors and based on the input control lights, motors and sounds. As well they have a multimeter to experiment and measure changes in voltage, current and resistance.
	Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].	

see online or contact us for more information on the full range

Only **£58.46** Order code 73-4642

K000007 Starter Kit Including Uno Board

This starter kit serves as a hands-on introduction to the basics of the Arduino system. Using the accompanying 170-page project book and the comprehensive kit contents, you will learn to build useful, creative projects.

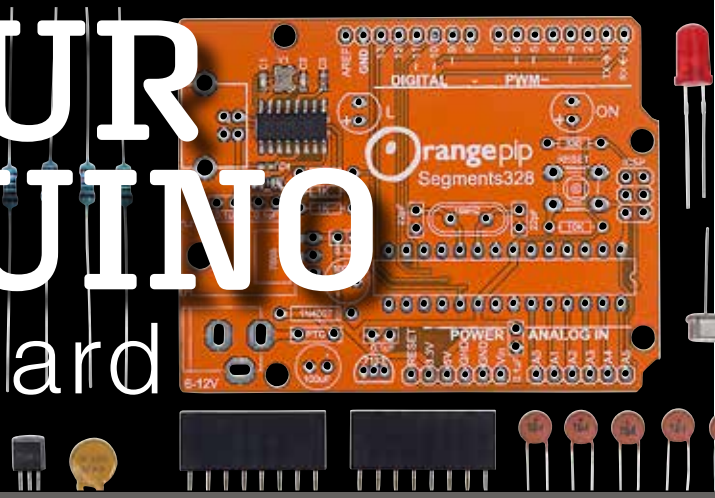
Only **£125.00** Order code 73-4865

AKX00014 Science Kit Physics Lab

The kit, based on the Arduino MKR WiFi 1010, includes a range of sensors to measure light, temperature, motion, and magnetic fields; plus it comes with a set of props and full access to online course content for teachers and students to conduct nine exciting science projects.

BUILD YOUR OWN ARDUINO

Segments328 board



You may well be familiar with an Arduino board and aware of all the clever things it can help you to do. But how many people understand how the Arduino works? Do you know what components make up the "magic" box?

This Segments 328 kit from Orangepip will let you into the secret - and will encourage you to develop your soldering skills in the process.

TASK – CONSTRUCTION OF BOARD

What you have got:

- PCB board pre-drilled
- 16MHz crystal
- ATmega328 microcontroller
- Dual in line socket
- Tactile switch
- Red and green LED
- 6 pin dual row header
- 2x 8 & 6 pin row sockets
- USB Socket
- Power supply jack socket
- 1x 10K, 2x 330R and 2x 1K resistors
- 2x 47uF electrolytic capacitors
- 1N4007 diode
- 7805 and 7133 voltage regulators
- PTC resettable fuse
- 0.1uF and 22pF ceramic capacitors

What you will need:

- Soldering iron, solder wire & helping hands assembly aid
- Side cutters
- Snipe nose pliers
- Multimeter

What you have to do:

- Insert each of the components into the board in the order and location as indicated on the Build Instructions manual
- Solder each component into place
- Follow our guide to installing the software and uploading your first program to the Orangepip Segments board that you have just made

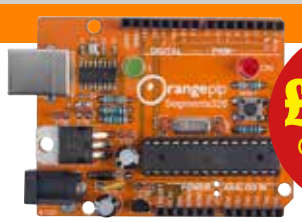
KEY STAGE 3+

Build & Programming PDF instruction notes available online!

Orangepip Segments 328 Build Your Own Arduino Class Pack of 15

£120.00

Order code 75-1201



Only **£11.95** Order code 75-1200

Orangepip Segments 328 Build your Own Arduino Kit

Orangepip USB Cable A Male to B Male 50cm

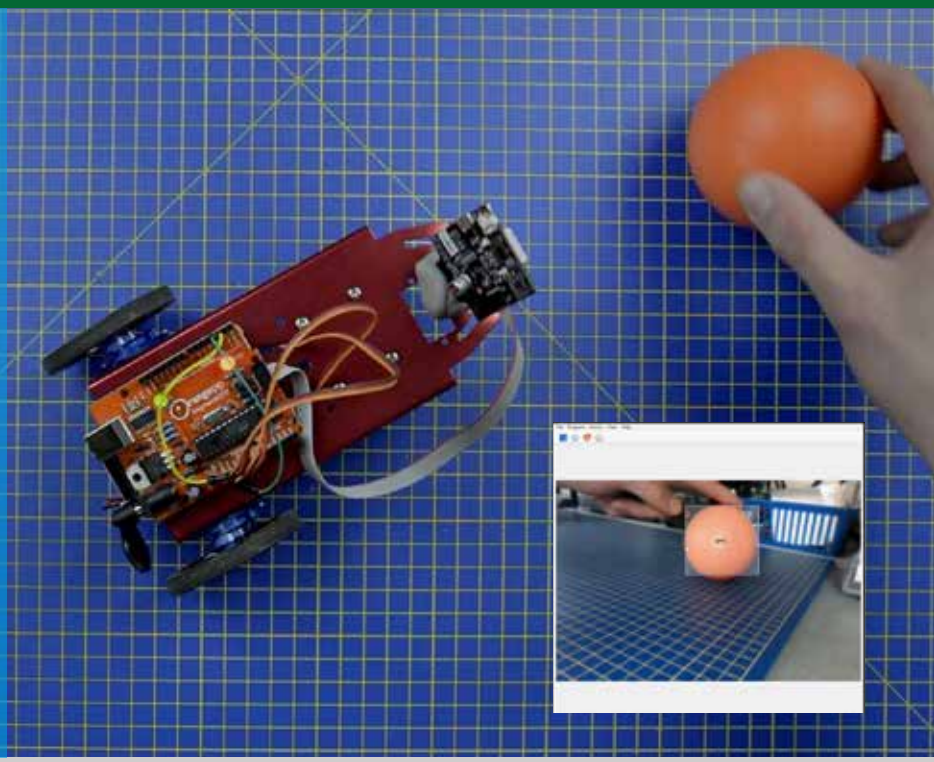
Only **£1.72** Order code 75-0552

Orangepip® Segments328

TASK
BUILDING A SIMPLE OBJECT TRACKING ROBOT

What you will need:

- Segments328
- Pixy 2 camera
- Servo robot platform



Watch our step-by-step video
youtube.com/rapideducationtv

HELPFUL TIP – IDENTIFY THE VALUE OF A RESISTOR

330R x 2 pieces.
Orange, Orange, Black, Black, Brown

1K x 2 Pieces.
Brown, Black, Black, Brown, Brown

10K x 1 piece.
Brown, Black, Black, Red, Brown

There are three ways to identify the value of a resistor:

1 Using a Multimeter
- Polarity doesn't matter to the measurement.
- It removes the possibility of misreading one of the resistor colour bands.
- It can be a quick way to check when you have multiple resistors.

2 Resistor Card
- It doesn't need power or the Internet so you can use it anywhere
- It teaches you to read the values without the aid of any equipment

3 Online guide
- Inputting the resistor colour bands will give you the exact value of the resistor
- The calculations are done for you which makes it easier to use than a resistor card.
- You just need to accurately identify the colours to get the correct result.

ACCESSORIES

Pixy 2 Vision Sensor Camera CMUcam5 Arduino / Pi Compatible

- Small, fast, easy-to-use, low-cost, readily-available vision system
- Learns to detect objects that you teach it
- Connects to Arduino with included cable.
- Kit contains: Pixy2 CMUcam5, Pixy IO to Arduino ISP cable, microUSB cable, mounting hardware

Only **£49.68** Order code 75-1010

CHARMED LABS

2WD Servo Robot Platform

Only **£13.20** Order code 70-6415

Rapid

- Strong, colourful aluminium chassis
- Supplied with 2 x servos and 1 x castor
- All screws and nuts included
- No motor drivers required

RHMM17 Digital Multimeter

Rapid

- Basic DC voltage accuracy 0.5%
- Large clear LCD display with backlight
- Low battery indicator
- Auto power off
- Display hold button
- Easy access for fuse changing
- Rubberised holster
- Red and black test probes
- K-type thermocouple temperature probe

Only **£22.07** Order code 90-0005

DRIVE FORWARD
IS THE NEW HELLO WORLD

VEX IQ is a robotics platform designed to transform STEM learning for young students (aged 8-15) and their teachers.

SUPER KIT

The Super Kit is where the VEX IQ experience begins. This comprehensive package is tailored to give you everything you need to build VEX IQ robots for both classroom and competition use. As well as having over 800 structural and motion components, the kits also contain motors, sensors, controller, batteries, charger, storage bin and free programming software.

Use the Super Kit to design your own robots from scratch or build one of the numerous robots from our detailed instructions.

Only £327.99
Order code 70-7891

VEXcode IQ 2.0

The VEXcode family of programming software is used across all VEX Robotics products. VEXcode IQ 2.0 gives students the ability to create code in Scratch blocks or using C++ making it simple enough to pick up in KS2 but able to challenge programmers all the way through KS3 and beyond.

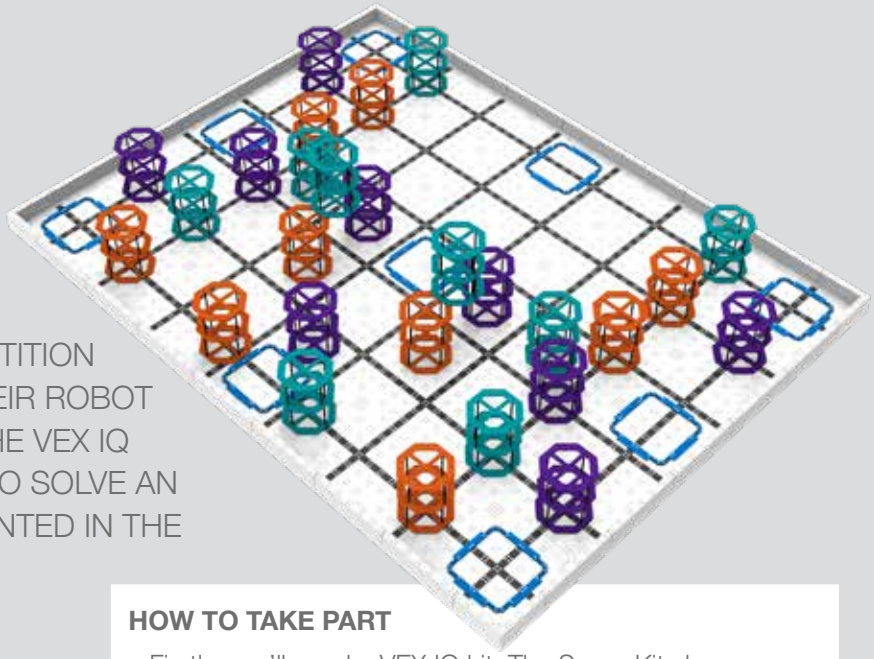
- Completely Free
- Integrated tutorials
- Scratch blocks and C++ text coding
- Available for Windows, Mac, Chromebook and iOS or Android tablets
- Download from www.vexrobotics.com/vexcode or via your device app store

No robot? No problem. Introducing VEXcode VR

Students can't get access to a robot all the time. Sometimes it is just not practical – other groups may be using the hardware or there is just not enough hardware to go round. VEXcode VR is a browser-based virtual robotics coding tool that uses the same VEXcode interface as physical VEX robots so helps to support learning when access to a robot is not possible.

- Free to use
- No sign-in or installation required
- Integrated activities to teach numerous programming concepts
- Scratch blocks and Python text coding
- Blocks to Text conversion to support progression
- Supplements the use of physical robots in the classroom
- Works on any device with a compatible browser
  - Windows – Chrome, Firefox or Edge (Chromium only)
  - MacOS – Safari
  - Android – Chrome
  - ChromeOS - Chrome
- VEXcode VR runs in your browser – get started at **vr.vex.com**

VEX IQ CHALLENGE RISE ABOVE



THE VEX IQ CHALLENGE IS A STEM COMPETITION FOR KS2 AND KS3 STUDENTS TO TEST THEIR ROBOT DESIGN AND PROGRAMMING SKILLS. IN THE VEX IQ CHALLENGE, STUDENTS BUILD A ROBOT TO SOLVE AN ENGINEERING CHALLENGE THAT IS PRESENTED IN THE FORM OF A GAME.

The 2020-2021 VEX IQ Challenge game is called Rise Above and it's a bit like three-dimensional noughts and crosses. The idea of the game is to use your robots to place the Risers in matching horizontal, vertical or diagonal rows. Once you have a completed row, you can make your scores even higher by stacking more Risers of the same colour on top of these in the row.

As with all previous years in the VEX IQ Challenge, there are three disciplines to master:

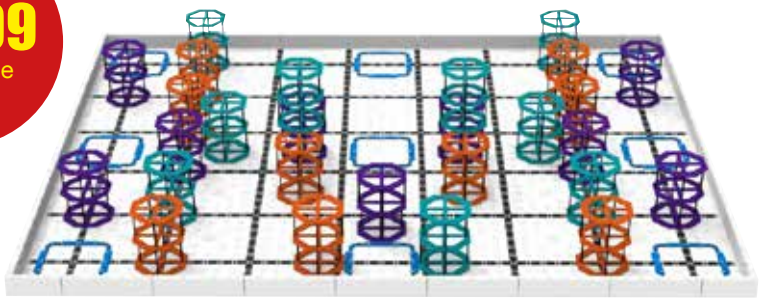
- Teamwork Challenge – you'll be paired with other teams and will need to work together to score as many points as you can
- Driver Skills - set the highest score you can with just your robot on the Field and using your controller
- Programming Skills – program your robot to score points autonomously, no controllers allowed

HOW TO TAKE PART

- Firstly, you'll need a VEX IQ kit. The Super Kit shown on this page is the perfect starting point and contains everything you need to build a robot. The kit is reused year after year.
- Next you'll need a way to program your robot – VEXcode IQ coding software is free and available for Windows, Mac, Chromebook and iOS or Android tablets
- Register a team at **www.robotevents.com** and sign up for events near to you. The 2020-2021 season will run later in the year than usual because of the logistical issues stemming from the Coronavirus pandemic. To find out more about how VEX IQ Challenge events will adapt to these circumstances, contact **education@rapidonline.com**
- Once you have registered a team, you will receive a Welcome Pack containing a Riser to help you design your robot. If you need inspiration for your first robot design, visit **www.rapidonline.com/vexiq** and go to the downloads section for robot build instructions. Rise is recommended for this game.

VEX IQ Challenge Fields

Only **£89.99** Order code 70-8212



Rise Above is the first VEX IQ Challenge game to be played on the new 6' x 8' (1.8 x 2.4m) field. Full fields in the new size are available now. For these who already have 4' x 8' fields, an upgrade kit containing the additional tiles and walls is available.

Having a Field means you can practice on the same surface as you would find at the competitions meaning your driving skills are sharper and your programs are more accurate.

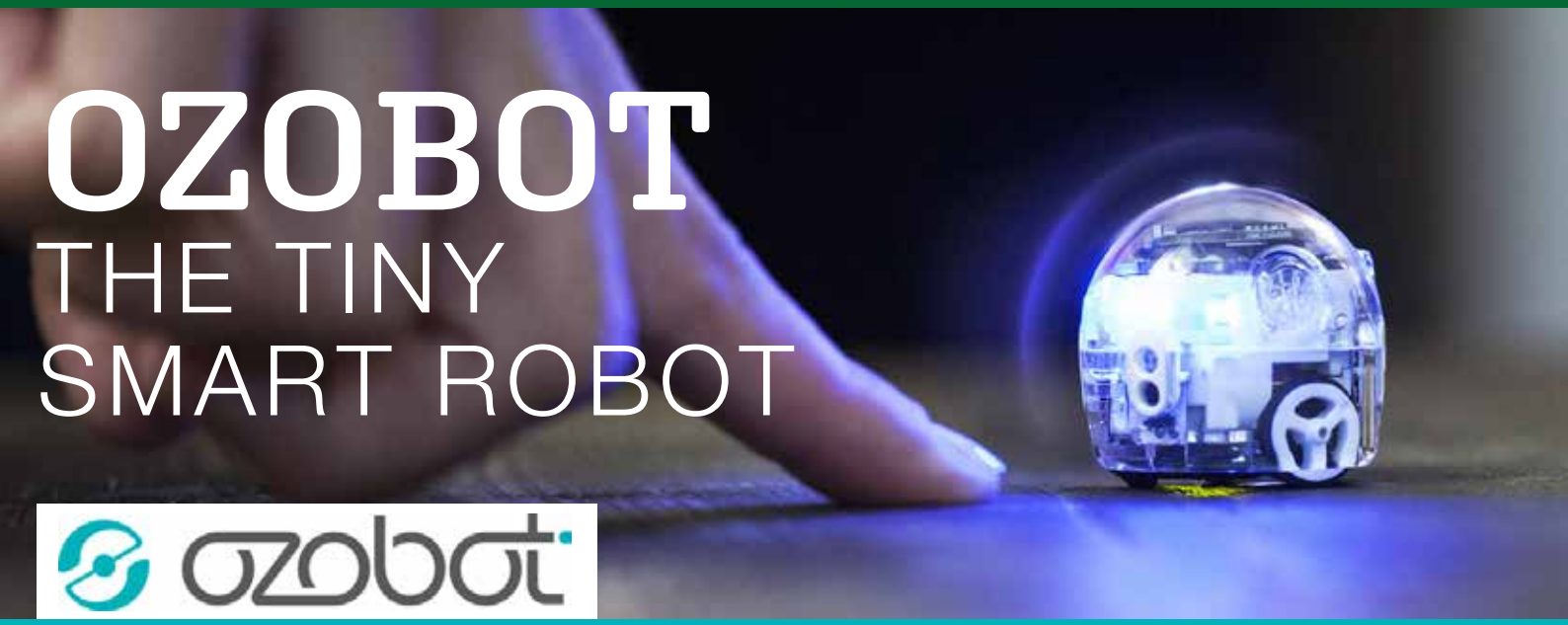
Fields snap together in minutes for easy storage.

Pin Tool

Only **£6.95** Order code 70-0146

The VEX Pin Tool makes working with VEX IQ pins and plastic even easier. Use the Pin Tool just as you would a pair of pliers. Simply place the tool over the pin you want to remove, squeeze, and pull!

The Pin Tool has two other useful features on its handles. One side can be used to pry two beams apart, while the other can be used to push out pins (such as a 0x2 capped connector) that the tool would normally not be able to grab.



OZOBOT
THE TINY SMART ROBOT

The Ozobot Evo is an award-winning coding robot for the next generation of creators. It can be coded in two ways: online with OzoBlockly programming, and screen-free with Colour Code markers.

OzoBlockly

OzoBlockly is a graphical programming language based on Blockly which is used by a wide range of educational coding tools. What makes Ozoblockly different is the five progressive programming modes that it offers.

Whichever skill level you are using, Ozoblockly has a built-in help file and plenty of challenges to keep your students busy. Simply colour-print the challenge "maps" on A4 paper and follow the task instructions.

1 Pre-Reader

Suitable even for reception age children, Pre-Reader is the most basic mode in OzoBlockly. It has clear picture-based blocks that are large and easy to assemble.

2 Beginner

Beginner mode extends from Pre-Reader with the introduction of simple loops. Blocks are now described with text titles as well as pictures.

3 Intermediate

Control Ozobot's ability to follow lines using the line navigation category. Intermediate mode also introduces some simple if/else logic blocks.

4 Advanced

Advanced mode significantly expands Ozobot's programmability with the introduction of repeat, while and for loops, more logic, integers, variables and functions.

5 Master

Take full control over Ozobot in Master mode with the addition of lists and arrays

To try Ozobot in your classroom for free please contact **education@rapidonline.com** for details on the free Robotics trial.

Upload your programs to Ozobot by simply holding it against the screen of your device.

- Tablets
- Laptops
- Desktops
- Interactive whiteboards
- Smart phones

Ozobot Bit Classroom Kit 18 pcs White

- The Bit classroom kit includes:
- 18 Bit robots
- Educator's guide
- 3 multi-port USB chargers
- 18 DIY skins
- Evo storage case
- Classroom Kit bin
- And much more

Only **£1114.94** Order code 70-8207

Only **£39.27** Order code 70-8200

Ozobot 2.0 Bit Robot - Crystal White

- 1x custom skin
- 1x carrying case
- 1x USB charging cable
- A demo playground
- Quick Guide instruction booklet

TASK – POLLEN LOVE WITH BEES!

Using Color Codes (or OzoBlockly) students will dress up their Ozobot like a bee.Then, they will recreate the bee's daily journey.

What you will need:

- 1 Evo or Bit Ozobot per group
- 1 Markers per group
- 1 Paper per group
- 1 Supplies to make bee costume per group
- 1 Tablet or computer (if using OzoBlockly) per group

Lesson Objectves

Explain the process of pollinaton orally and through a drawing

Student Practce (Student Facing Instructons):

1 Using the materials provided, create a bee costume to put on your Ozobot.
Goals: Create and atach a bee costume to Ozobot.

2 Create a map to tell a story of the day in the life of a bee. You must include drawings.
Goals: A map of the bee's journey.

3 If using Color Codes, draw a black line to guide your Ozobot bee. You must include at least two diferent Color Codes along the journey.

For OzoBlockly, code your Ozobot bee on your tablet or computer. You must include at least two block codes that are not directons.

Goals: Code the Ozobot bee's journey.

Direct Instructon (Teacher Facing Instructons):

1 Start by giving a quick explanaton of the pollinaton process and background info on bees. How do bees pollinate flowers? What are some threats that bees face daily? Where do bees live? Why is pollinaton important?

2 Pair students up in groups (the number of students per group is up to you) and give them markers, a sheet of paper, and any materials you have for them to create a bee costume for their Ozobot. NOTE: If using OzoBlockly, also provide them with a tablet or computer.

3 Instruct the students to recreate a day in the life of a bee. They must create a map (if using Color Codes) that will guide their Ozo-Bee around. They must include pollinaton, a bee threat, and a beehive. NOTE: If using OzoBlockly, the students will stlll create a map, just not use black lines. They will code Ozobot to move using OzoBlockly.

4 The students must include at least two diferent Color Codes on their map, such as stopping at flowers to pollinate or speeding away from a bird.

5 You can have students present their maps to the class, or even record them.

WONDER LEAGUE
MINI MISSIONS

Dash and Dot are the coolest, cutest robots around and they are on a mission to help teach KS1 and KS2 aged children. Both robots are feature-packed and can be programmed with Android, iOS, Kindle and Chromebook devices. Dash robot and Dot robot come ready-assembled and require almost no set up. They even have built-in rechargeable batteries so getting going couldn't be easier.

TASK – MINI MISSION #1

What you will need:

- A robot (Dash or Cue)
- Six individual cups
- Your device
- Your 150cm by 240cm grid mat with 30cm grid cells

Set up:

- Start Dash in C1
- Put 1 cup upside down in the corner of D3, D4, C7, C8, B3 and B6.

Directions:

- Program your robot to show off all the colours of the rainbow.
- As you travel to each cup, use the light blocks to showcase the color that is in
- Have your robot finish in A8.

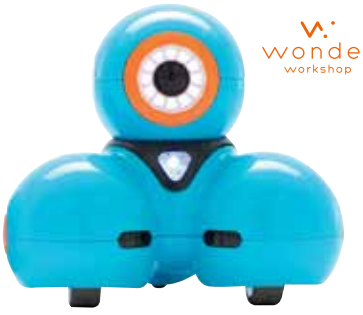
Take it further

- Can you program your robot to move all the cups into their own cells in column 8 in the rainbow sequence?

Class Bundle

Class Bundle contains:
- 10x 70-1100 Dash Robot
- 5x 70-1110 Sketch Kit
- 5x 70-1114 Gripper Kit
- 10x 70-1107 Challenge Cards
- 1x 70-1109 Learn to Code Guide

£1,641.85
Order code 70-1120



Dash Robot

Dash robot is one of the coolest, cutest robots around and it's on a mission to help KS1 and KS2 children learn to code.

£130.95
Order code 70-1100

Dot Robot

Dot is Dash's companion and is the brains without the brawn! Whilst Dot doesn't have wheels to make it move, it has loads of cool sensors and can interact with Dash as well as being used as a stand-alone device.

£44.99
Order code 70-1101

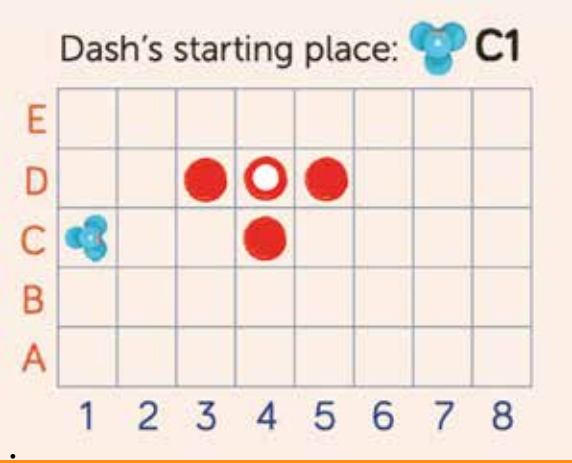
TASK – MINI MISSION #2

What you will need:

- A robot (Dash or Cue)
- Four individual cups
- Your device
- Your 150cm by 240cm grid mat with 30cm grid cells

Set up:

- Start Dash in C1
- Put 1 cup upside down in the center of D3, D4, D5 and C4.
- Put 1 ping pong ball on top of the upside down cup in D4.



Directions:

- Program Dash to move all four cups into their own individual cells in row E.
- Be sure not to knock over the ping pong ball on top of the upside down cup in D4.

Take it further

- Can you program your robot to move all the cups into their own cells in row E with only moving x cm total?
- How about x cm?

cue™

Cue is a programmable robot who is closely related to Dash. Visually, Cue looks really similar to its brother, but the biggest difference is how Cue is programmed. Whilst Dash is ideal for learning coding at Key Stage 1 and 2, Cue is better suited to Key Stage 3

CUE
£120.69
Order code 70-1108

Cue and the curriculum

Here are a few ways in which Cue can help deliver the computing programmes of study at KS3:

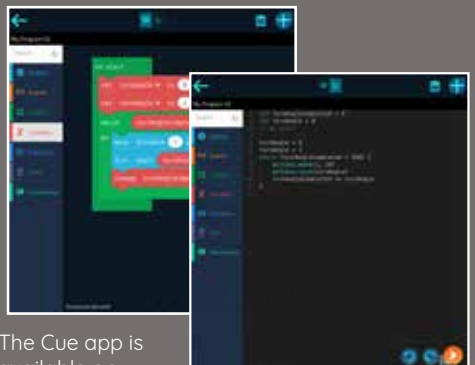
- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems – **use Cue to simulate autonomous navigation, social robots, human-robot interaction**
- Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem – **collect and filter data from sensors to remove errors, create an algorithm to solve a maze, create an algorithm to draw a specific shape using the sketch kit**
- Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions – **Cue app allows you to use both blocks and text (JavaScript) to create programs. In both, students can create functions, variables and use events**
- Understand simple Boolean logic [for example, AND, OR and NOT]and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal] – **all standard Boolean logic can be implemented in the Cue app using both block and JavaScript coding**

Accessorise and customise!

Because the shell of Cue is identical to that of Dash, it is compatible with all the same accessories including the Building Brick Connectors and the Sketch Kit. (70-1110 & 70-1105)

Programming

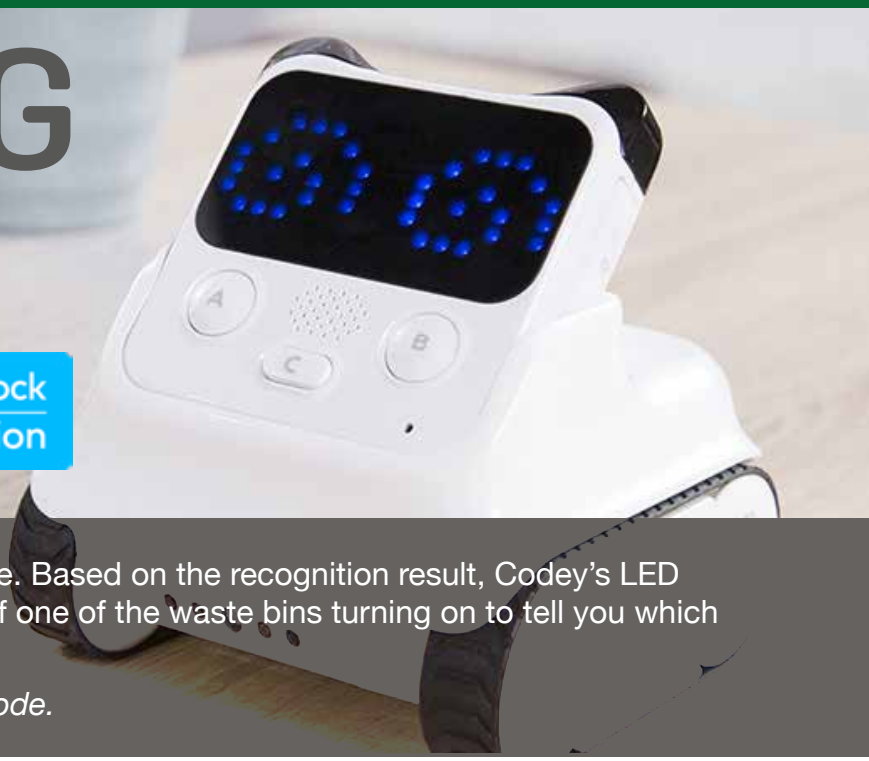
Cue is programmed using an app using Microsoft's MakeCode platform. It's the same tech that the micro:bit programming language is built on which means it is tried and tested in an education environment. Like its micro:bit counterpart, the Cue app allows you to code in a graphical block language or using a text-based JavaScript environment.



The Cue app is available on Windows 10, iOS & Android devices.

SORTING WASTE PROJECT

makeblock education



This program helps recognize and classify waste. Based on the recognition result, Codey's LED display will show a sign with the lights in front of one of the waste bins turning on to tell you which bin you should throw your waste in.

Note: This program should be run under Live mode.

TASK – DATA FLOW

Deep Learning Extension

Watch our video

youtube.com/rapideducationtv

Codey Rocky Programmable Robot

£63.75

Order code 75-0516

Magnetic USB Lead with Micro USB Connector 1m

£5.20

Order code 19-9930

TASK – CREATING A TRAINING MODEL

Training model → Learn the samples → Use the model

Note: Adding more pictures (30+) increases the accuracy of the model

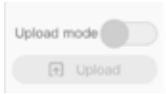
TASK – USING THE MODEL

We want Codey Rocky to respond to the trained model.

When you have written your code, you will need to upload it to your robot.
You can follow the steps below:

1. 
Select Codey Rocky as the device

2. 
Upload the code you have written

3. 

Turn off upload mode

4. 

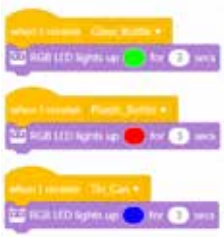
Run your chosen event to start your program

HOW TO USE THE TRAINING MODEL WITH A SPRITE

HOW TO USE THE TRAINING MODEL WITH CODEY ROCKY

Sprite environment:

Device environment Codey Rocky:



TASK – PEDAGOGICAL APPROACH

AS YOU WORK THROUGH THE TASKS TOGETHER CONSIDER WHAT YOU ARE LEARNING:

Technology literacy: exploring the software & hardware
Information literacy: what data is being processed to analyze the images and how does information flow?

Group work

- Collaboration: work together to solve the problem
- Communication: share your ideas
- Social skills : listen & reach agreements together

Activities

- Problem solving: write a code so that mBlock recognizes & processes the image
- Creativity: there are many ways to reach the objective
- Flexibility: try different options to solve the problem

CRAFT & CODE

Interactive Stories

Craft a city out of cardboard, or draw a city to make an interactive poster. The idea behind this project is to craft or create buildings for an imagined city and then tell the story of the people who live in your crafted buildings.

Makey Makey are sharing this idea from the LEGO Foundation who are "inviting kids to create the buildings, neighborhoods, and stories of #StoryCity, a collaboratively constructed and imagined city that will let kids connect around the world."

The picture below is an interactive #StoryCity Poster. The picture on the right is a crafted #StoryCity by Liam Nilsen. In fact you can craft your Story City however you would like! Either draw a city, build a city, or construct a city in a shoebox. The important thing is to imagine the buildings and the stories of the people who live in your crafted city.

TASK – ADD CONDUCTIVE TOUCH-POINTS TO YOUR CITY

Use thumbtacks, paper clips, or pencil drawings to make your city interactive with Makey Makey and Scratch. By adding different conductive touchpoints you are building the hardware that will go with the software you create in Scratch!

Everyday conductive materials:
Kitchen foil – paperclips – pencils – staples – pins – coat hangers

Plus many more!

Makey Makey Inventors Kit

- Arduino compatible
- Simple USB connection
- Challenge and expand your imagination
- Invent ways to experiment and play
- Almost anything can be used as a keyboard

£41.17
Order code 73-5500

Only **£17.68**
Order code 73-5502

Makey Makey GO Includes Case with Magnet, Croc Lead, Keyring & Instruction Guide

- Contents: USB Invention Stick, case with magnet, 1 white crocodile lead, key ring, and instruction guide
- Simple USB connection
- Have fun and expand your imagination

TASK – PROGRAM EVENTS; CODE STORIES AND ANIMATIONS IN SCRATCH

Write the stories you want to tell on a piece of paper or type them up so you can record them easily into Scratch. If you use multiple sprites in your Scratch project, you'll have to record your stories with the correct sprite. Scratch is the software component to your interactive story invention! Let's look at some examples before you start coding your own software.

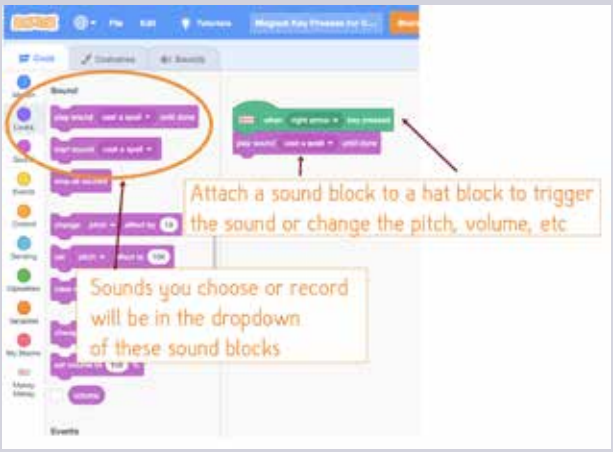
Here is an example of a coded Story City drawing in Scratch. Press the UP arrow to hear one story. Press the SPACE bar to hear another story. Lastly, press the DOWN arrow to experience the final story.

Here is an example of the coded story diorama in Scratch. To play along, Frederico asks you to find the pigeon drawing (press the SPACE key), the Family Portrait (which is connected to the UP arrow), the hiding dog (press the DOWN arrow), and the messy scribble by Bonnie (press the RIGHT arrow).

TASK – RECORD SOUNDS

To add your stories as sounds to your project, click on the "Sounds" tab where you can choose a sound from the Scratch library, record your own sound, or upload an mp3 or wav file to use in your project.

Click on the microphone to record your own sound.



TASK – CODING ANIMATIONS WITH MOVEMENT AND EFFECT

To get started making your story even more interactive, you'll need to understand a few things about coding. To create the software for your Makey Makey inventions, you have to speak to your computer in a language it understands!

Hook up Makey Makey and Share

Once you've coded your story in Scratch, hook it up to Makey Makey and share it with us!

REUSE AND RECYCLE?

MAYKU–Lamination

Explore the issue of the long lifetime of plastics and the challenges associated with recycling them. Investigate alternatives to traditional plastics in contemporary product design.

Use the Mayku FormBox to recycle plastic bags into various objects.

CHALLENGES OF PLASTIC RECYCLING

Teachers introduction to the project:

- Explain how some plastics are easier to recycle than others, but that all of the recycling processes are costly and require additional energy.
- Introduce bioplastics and how some materials like PLA have the properties of plastics, but are made from renewable resources unlike traditional oil-based plastics.
- Give some examples of contemporary design that utilises other materials instead of plastic, like metals or wood, which is more environmentally friendly.
- Show some examples of plastics being reused or "upcycled".

TASK – UPCYCLE USING LAMINATION

WHAT YOU WILL NEED:

- Mayku FormBox
- Vacuum Cleaner
- 4 Plastic shopping bags per student
- Iron (Ideally one iron per 4 students)
- Greaseproof paper
- Masking tape
- Ruler
- Scissors
- Forming Template

STEP 1

- Begin by cutting plastic bags into single sheets along the seams of the bag, ensure that any doubled-over edges and reinforced handles are cut off.
- You will need 8 layers of plastic, which would require 4 bags.

STEP 2

- Tape down a length of greaseproof paper to the table with masking tape.

Only **£479.00** Order code 70-0021

FormBox Desktop Vacuum Forming Machine

- Bed size 200 x 200mm
- Heater range 160 to 340°C
- Compatible with PETg, HIPS, ABS, polystyrene, polycarbonate, polyethylene and acrylic PMMA from 0.25 to 1.5mm thickness
- Dimensions 466 x 274 x 315mm
- Two-year manufacturer's warranty

Mayku Teach Bundle

- A Mayku FormBox
- 100 Mayku Standard Sheets (Compostable)
- Mini Vacuum Cleaner
- Mayku Teach Curriculum Organiser
- Safety Handles
- Education Safety Stickers
- Access to the Mayku Teach portal
- Two-year manufacturer's warranty

Only **£749.99** Order code 70-0151

White 0.5mm HIPS Sheet 30 Pack

Only **£25.91** Order code 70-0029

Transparent 0.5mm PETG Food-safe Sheet 30 Pack

Only **£25.91** Order code 70-0028

Tel: 01206 751166 Fax: 01206 751188

STEP 3

- Lay the first two layers of plastic on top of the sheet of greaseproof paper, lining up the edges of the sheets.
- Lay another length of greaseproof paper on top of the layers of plastic.

STEP 4

- Use an iron which is turned up to the highest temperature to laminate the plastic sheets together. Begin in the centre and use a circular or zigzag motion to cover the whole area. Ensure you apply pressure and spend enough time across the whole area to fully fuse the layers together.

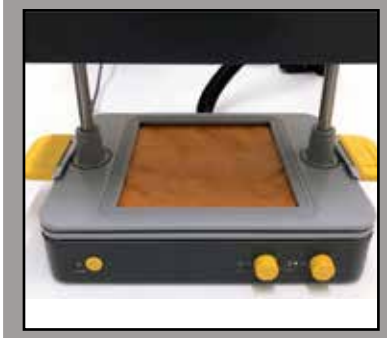
STEP 5

- Fully peel away the top layer of greaseproof paper and check that the plastic is fully laminated.
- Add another layer of plastic to the 2 layers you just laminated and repeat the process.
- All 8 layers of plastic should be laminated together in this way.
- When this is complete, allow the plastic to cool.

STEP 6

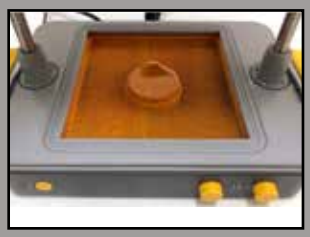
- Trim a 235mm x 235mm square from this sheet with a pair of scissors so that it will fit in the FormBox.

STEP 7



- Place the template in the centre of the vacuum plate.
- In our example here we have made a recycled coffee cup lid and a mask. A whole variety of objects can be made, try and link this object to a past or upcoming project.
- When the plastic is ready you will see it soften across the whole sheet, be sure not to overheat the plastic.

STEP 8



- Form the template with the recycled sheet.

STEP 9

- Allow the plastic to cool and remove the whole thing from the FormBox.
- Gently pop the template out.
- Carefully cut away the excess with a pair of scissors.

TASK – BENEFITS AND DISADVANTAGES OF RECYCLING

After the activity is complete discuss the benefits and disadvantages of recycling. Compare the properties of the recycled plastic to the original kind used for the object which has been remade.

A GUIDE TO 3D PRINTING

Designing a model

Don't fall into the trap of merely demonstrating the process by downloading and printing files from the internet. 3D printers can form an invaluable part of the design process, but you will need to be able to create 3D models using one of the many pieces of 3D CAD software that exist on the market if you are to get the most from your printer.

The good news is that the software doesn't have to cost anything. There is a wealth of CAD tools available that are free to use and that will give you all the features that you will ever need. The other good news is that the days of needing high-powered workstation computers for CAD are also a thing of the past which means you have probably already got everything you need to start using this kind of software in your school.

If you have no CAD experience at all, Tinkercad is a great place to start. It runs in your browser window and allows you to "borrow" other Tinkercad users projects and modify them, which is a great way to see how others create 3D models and work your way up to creating your own designs from scratch. For those that fancy something a bit more high-end, have a look at Fusion360 – industry-level CAD software which still has a shallow enough learning curve to make it accessible to novices.

www.tinkercad.com

www.autodesk.com/education

Time

The process of 3D printing is quite slow, especially when using the extruded plastic filament style machines which are the type most commonly used in schools. If you are creating a particularly large piece, it's not unheard of for prints to take 20 hours and with a class of 20 students in a D&T workshop, you could be looking at weeks of print time to get through everybody. Because of this, it's important to get your students to design objects that can be 3D printed in a set time frame.

The Airgineers Micro Drone project is excellent for this – frame designs can usually be printed in less than 2 hours.

Make parts, not entire objects

Once you have mastered CAD, it's tempting to make some extremely complex models to print. However, 3D printers lend themselves to making parts much better than making entire objects. For example, if you were making an architectural model of a building, rather than trying to 3D print the entire design, use laser or hand cut modelling board for large flat expanses like walls, but use 3D printed parts for items such as corbels, buttresses, staircases or other intricate shapes.

Think about the process of 3D printing when you are deciding what is the best tool for producing your part. To minimise post-production work, you want your model to require as little support material as possible which can be helped by choosing the optimal orientation on the bed when printing the part or minimising the number of overhangs where the angles are greater than 45 degrees, since most printers can happily print 45 degrees or less with no support material at all.

A question of capacity

When selecting a 3D printer, the vast ranges of different machines and specifications can make choosing the right one a daunting task. One of the factors that needs to be considered is the build volume which controls the maximum size of object that you can produce. Printers with a bigger build volume tend to be more expensive but bigger is not always better, especially in a classroom environment. Sometimes, having a larger number of smaller machines can be more beneficial than one large one because whilst you can place lots of different models on a large bed to be produced at the same time, you need to wait until all the models have finished printing before the students can get their hands on their designs. Why is this a big deal? Because design is always an iterative process and you probably won't get it right first time. By having a greater number of smaller machines, you maximise the amount of availability for starting new prints which means students can get their designs manufactured as soon as the next iteration is ready.

The UP Mini 2 is perfect for this. At £465, you can have three machines and plenty of spools of spare filament for less than the price of a larger machine like an Ultimaker 2+.

Get to know your 3D printer

Make sure you experiment with your machine so that you know how it is going to perform. This knowledge will help you to give good advice to your students when they are designing parts. How much shrinkage will they need to accommodate? What is the smallest wall thickness it can reliably print? It's also a good idea to have a few ready-made example models which can be used to demonstrate how long a print of a given size is likely to take.

CHRISTMAS ILLUMINATION

LED PROJECTS

Rapid LED Christmas tree kit

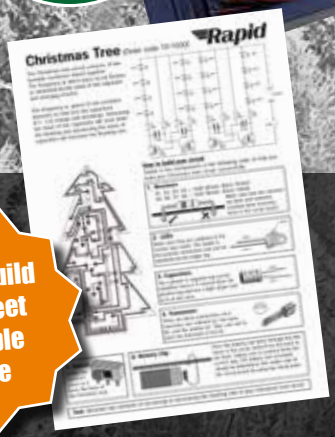
A simple festive project for students to build in one lesson. It will test their soldering skills and improve understanding of bistable circuits. Also, a cool decoration to take home!

SINGLE £3.64 Order code 70-1000

CLASS PACK £53.00 Order code 70-0005

Watch our step-by-step video

youtube.com/rapideducationtv



How to build datasheet available online

velleman

Only £21.53 Order code 70-4466

Seasonal Minikit Pack

The Velleman Seasonal Minikit Pack contains 5 different projects all with a festive theme. This pack contains the following kits: Electronic Christmmas Tree (Rapid part 70-4382), Flashing LED Sweethearts (70-4002), 3D Christmas Tree (70-4386), Electronic Candle (70-4406) and Flashing Red LED Star (70-4410).

Only £7.65 Order code 70-4410

Flashing Red LED Star Electronics Kit

velleman

- 35 LEDs included
- Safe battery operation
- Flashing or static operation
- Can be used on desktop or hanging from the ceiling
- Multiple kits enhance the effect
- In-car (12V) operation possible
- Current consumption 40mA (static mode)
- Flash duty cycle 1:2
- Dimensions 90 x 90mm
- Power supply 9Vdc battery

4tronix

Only £6.50 Order code 75-0150

Addressable LED Santa Claus for Base:Bit Music box

The LED Santa Claus for Music Box Base:Bit is designed to plug into one of the two positions on the Music Box Base (75-0149), and has 10 Addressable LEDs all about him that are all RGB and can be individually programmed.

velleman

Only £15.73 Order code 75-4000

Riding Santa Kit

- 126 multi-coloured LED lights
- Suitable for use in cars, lorries etc.
- No need to remove battery when using external supply
- On/Off switch included
- Some soldering experience recommended
- Suitable for beginners
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