Name:		D&T Group:	
Teacher:		Tutor Group:	

Steady Hand game

Year 7

Subject: Design & Technology

Y11 Minimum Target: _____

Your work will be marked as:

Below / On / Above / Well Above

the path to this target.

The crazier the better!

do you like the safe option?

Homework

Homework 1: Fill out the table on the Homework 1 page, identifying the components and what they do.... What are the proper component schematic symbols?	**Homework 4:** Final Design Layout. Draw out extremely carefully your final design layout. The design must start at the start point and finish at the finish point.
Homework 2: Fill out the flowchart on the Homework 2 page, 'How To Solder Safely', following the 3 tasks laid out on the right hand side of the page.	**Homework 5:** Make sure that your designs for the 'Backboard' and for the instructions are completed to the highest quality you can do.
Homework 3: Use the templates to design a range of possible design for the embellishment on the side of your case. Remember what you have put down in your Design Specification.	**Homework 6:** On the Homework 6 page, complete an evaluation of your Steady Hand Game.

Designing

This work is

Below / On / Above / Well above

your minimum target path

Making

This work is

Below / On / Above / Well above

your minimum target path

Marking Summary

Use this space to keep track of your marks throughout the different sections of the project.

Evaluating

This work is

Below / On / Above / Well above

your minimum target path

Technical Knowledge

This work is

Below / On / Above / Well above

your minimum target path

Overall Project

This work is

Below / On / Above / Well above

your minimum target path

Design Brief:

Young people need games and toys that will develop their hand to eye coordination skills. Your brief is to create a 'Steady Hand Game' for a play room in a children's hospital ward.

You will be required to model and make an electronic circuit using the 'Printed Circuit Board' (PCB) method, use 'Computer Aided Design and Manufacture' (CAD / CAM) to make the case and use 'Desktop Publishing' to make backgrounds and instructions.

Identifying User Needs — Role Play

In groups, take it in turns to role play a child in hospital with an injury whilst the rest of the group ask you questions to find out how this affects the design of their game.

Injury	Design considerations
♦	♦
♦	♦
♦	♦
♦	♦

Mind Map (Brainstorming Themes)

Possible themes for my game

In order to get a higher level, make sure you really be creative in your themes...

Specification

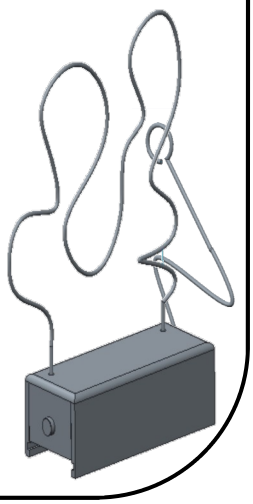
Working Towards: Produce a specification which covers most of the requirements with some explanations

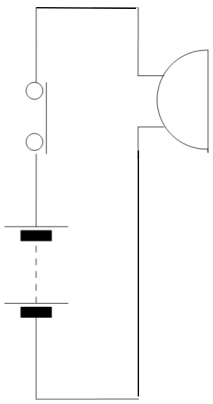
Secure: Produce a detailed specification which covers the general needs and requirements

Confident: Produce a full and detailed specification covering all the key points with a detailed explanation for each point.

A set of rules, that you agree on with your client, before you start designing your solutions. Use the Design Brief and the role-playing exercise to add criteria to the specification.

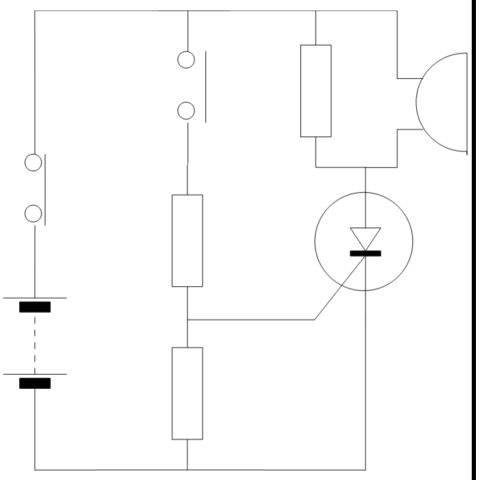
- Must be complete within the 12 weeks





Lets Focus now on the Electronics:-

The aim is to move the handle around the wire shape without touching it. If the handle touches the wire a buzzer sounds. A basic circuit for this is a battery, buzzer and switch using crimp connectors to make the joints. This is shown below on the left. A more complex version of this could use a Thyristor to latch the sound on when touched. We can model this on Crocodile Technology later in the project and would use a PCB to make it. The circuit for this is shown on the right.



The Electronics

The style of drawings to the above is called a ..... . We use them to show in a pictorial view what we need to make.

Homework 1

Fill out the table below, use the component names at the bottom of the table to help.

Component Drawing	Component Name	Component Symbol	Description Of What The Component Does
			
			
			
			
			

Buzzer *Push-To-Make Switch* *Thyristor* *Resistor* *Battery*

Products that do something when we switch them on are called systems. Systems all have an

Input -> Process -> Output

The input of our circuit is.....

The process is .....

The output is.....

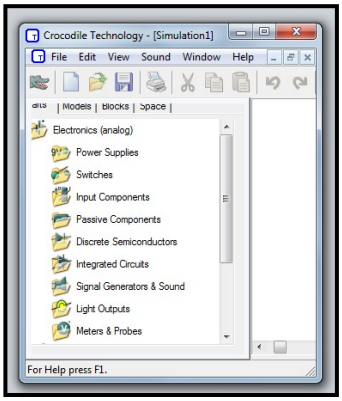
Teacher Feedback:

Technical Knowledge

This work is

Below / On / Above / Well above

your minimum target path



Crocodile Technology

Using the circuit schematics at the bottom of page 3, model the Steady Hand Game circuits in Crocodile Technology. You will find the components, using the symbols you found for homework on page 4, in the Electronics (analog) menu of the program.

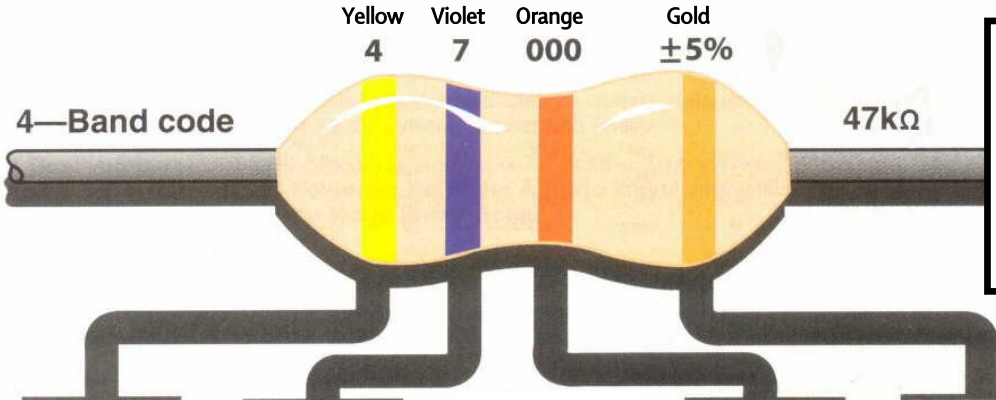
All the resistors in the circuit are 1K Ohms and these will need to be set.

Print out your Crocodile Clips circuit and stick it into this box, labelling all the components used.

Describe the difference in how the two circuits work?

Extension Task: Can you research how a Thyristor works and explain how it controls your circuit?

RESISTOR COLOUR CODE



The function of a resistor is to oppose the flow of current in a circuit.

	1st Digit	2nd Digit	Multiplier	Tolerance
Black	0	0	1	
Brown	1	1	10	1%
Red	2	2	100	2%
Orange	3	3	1000	
Yellow	4	4	10000	
Green	5	5	100000	
Blue	6	6	1000000	
Violet	7	7		
Grey	8	8	0.1 Gold	5% Gold
White	9	9	0.01 Silver	10% Silver

Resistors have different values of resistance to the flow of current.

Resistance is measured in Ohms ( ).
1000 = 1K
1000000 = 1M

Example:

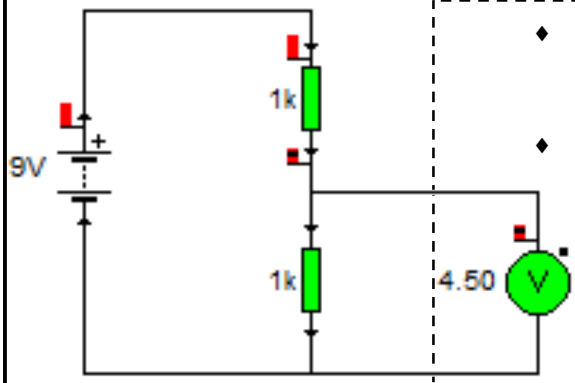
Band 1	Band 2	Band 3	Band 4	
Yellow	Red	Orange	Gold	42,000 = 42K
4	2	000	5%	

Working in Pairs, use the colour code to find out the value of the resistors you have been given, then using the multi-meter check your answer. Record your results in the table below:

Band 1 Colour	Band 2 Colour	Band 3 Colour	Band 4 Colour	Resistor Size	Multi-meter Value	Correct

Potential Dividers, Variable Resistors and Transistors

You can use resistors to control the voltage in a circuit. If you can control the voltage then you can turn components on and off. You can use resistors to make a potential divider. This is a major control option in electronics and they are used to control 'Transistors' which are the basis of most control and amplification electronics.



Extension Task: What happens if you have three resistors in series?

- Set up the Potential Divider circuit on the left in Crocodile Technology.
- Change the size of the resistors, one at a time, and look to see what happens to the voltage on the voltmeter. Describe what happens below:

.....

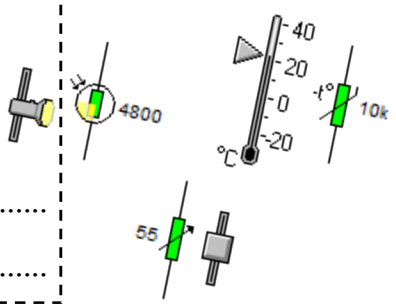
.....

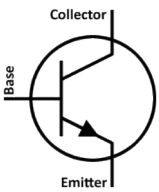
.....

Now change one of the resistors with the variable resistors shown on the right. There is a ***Light Dependant Resistor*** (changes its value with the light level), a ***Thermistor*** (changes its value with heat) and a ***Variable Resistor*** (changes its value with a sliding knob). What happens now:

.....

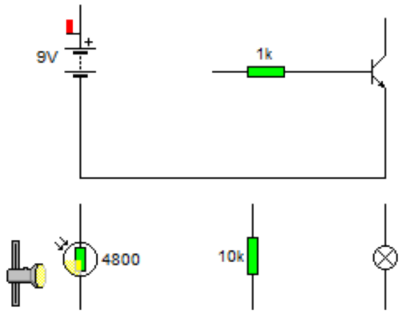
.....





Transistors are like electronic switches. They turn on and off depending on the voltage that is connected to the 'Base' leg. This then allows current to flow through from the 'collector' to the 'emitter'.

Complete the circuit below, using the components provided, to make an automatic night light. Try it on Crocodile Technology.

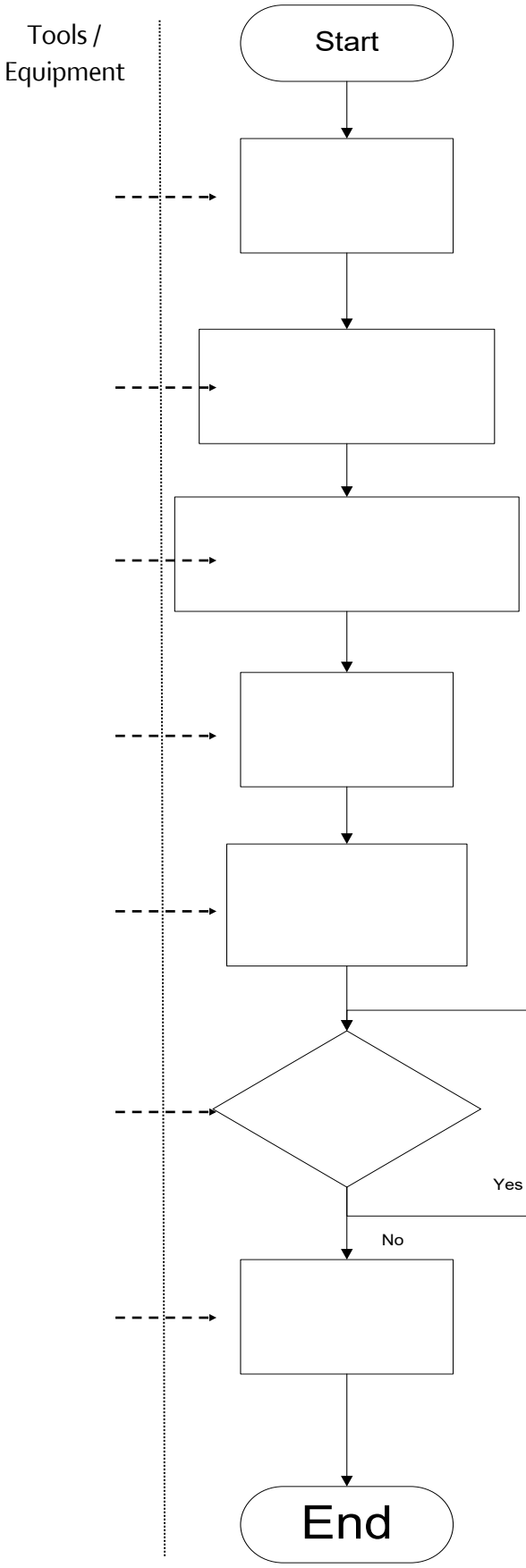


Print out your Crocodile Technology Transistor Switching circuit and paste it in here.

Homework 2

Watch the video: www.youtube.com/watch?v=AqvHogekDI4

Fill out the flowchart below about how to solder safely, following the 3 tasks laid out on the right hand side of the page.



Task 1 Below are listed the steps for soldering, however, **they are mixed up** and need to be put in correct order in the flowchart.

a. Touch the solder onto the joint until it flows
b. Bend the component legs and place into the correct holes
c. Clean and tin the tip of the soldering iron
d. Wait for a few seconds
e. Is it a dry joint?
f. Re-solder joint
g. Snip off legs of component
h. Place the soldering iron against the track and the wire of the component

Task 2

On the left hand side of the flow chart, list which tools/ equipment you would use at each stage. These could include: solder, soldering iron, pliers, sponge, side cutters and more...

Task3

List 5 health and safety rules when soldering:

.....

.....

.....

.....

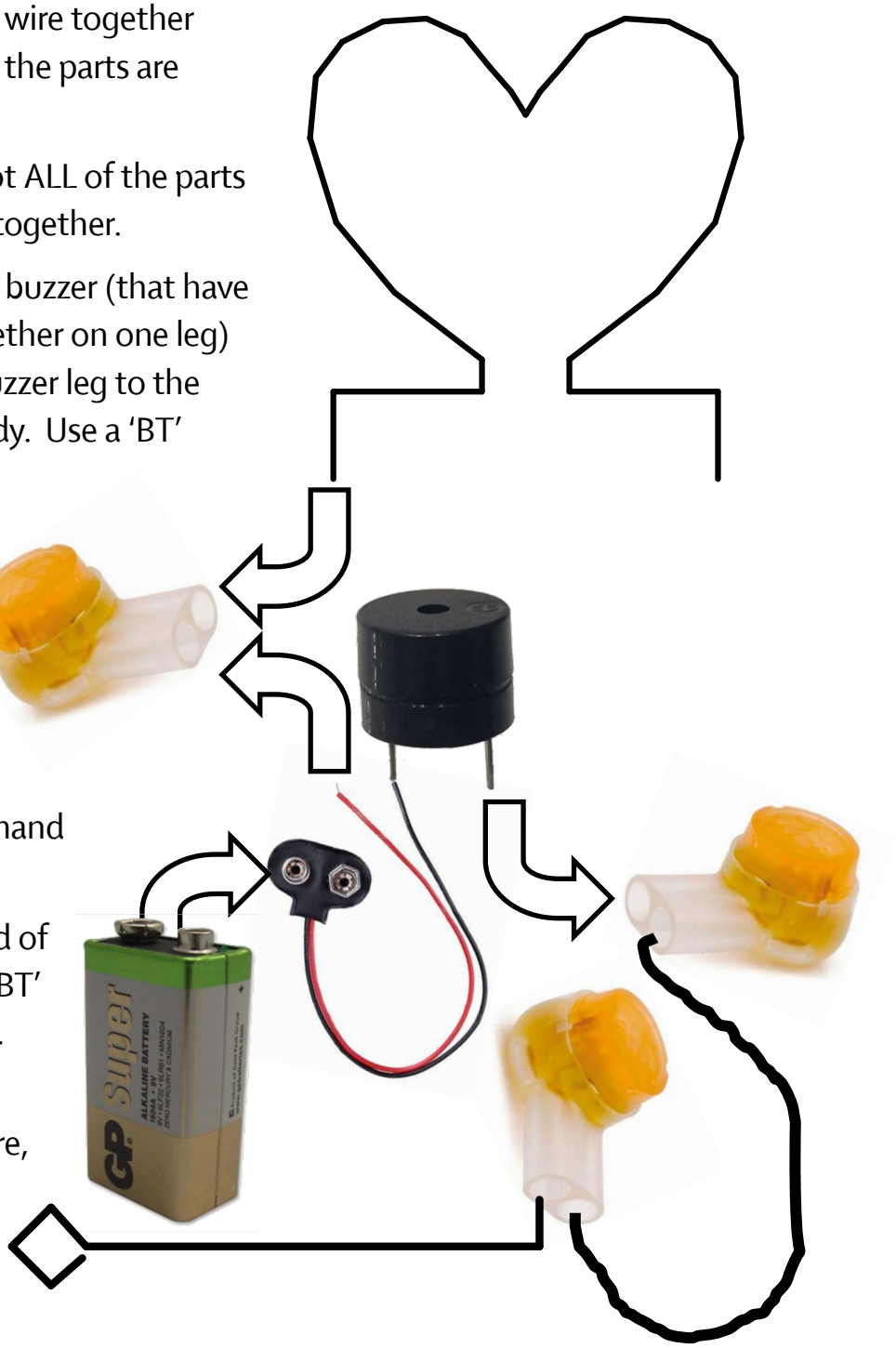
.....

Wiring the Steady Hand Game!

Using this checklist you need to wire together your steady hand game once all the parts are complete.

Only start this once you have got ALL of the parts ready and your final case glued together.

1. take your battery snap and buzzer (that have already been attached together on one leg) and connect the second buzzer leg to the long wire you have cut ready. Use a 'BT' crimp connector and a pair of pliers to do this.
2. The other end of the long wire needs to pass through the small hole in the square end of your steady hand game case.
3. Attach the wand to the end of the long wire using a 2nd 'BT' crimp connector and pliers.
4. Put your bent wire shape, made from the welding wire, through the top holes of your case, so that the short, straight, vertical pieces pint into the case.



5. Attach the free wire from the battery snap connector to one end of the shaped wire inside your case using a 3rd 'BT' crimp connector. This is the tricky part!
6. Hand in your whole practical piece for final gluing.
7. Plug in a PP3 battery to the battery snap, attach the base and test if it works.

CAD / CAM

In the space below find out what the Acronyms of CAD and CAM stand for, and explain in your own words what they mean.

CAD -

Explanation:

CAM -

Explanation:

Careers Research:

Use the space below to list as many 'careers' you can find that might use CAD and/ or CAM. This is not a list of products made by CAD / CAM but a list of jobs for people who use CAD / CAM. For extra marks can you describe 'How' they use it too...

Homework 3

Use the templates below to design a range of possible embellishments for the front side of your case. Remember what you have put down in your Design Specification for your theme. This is to engrave with a 'kiss cut' into the side panel of the case, remember that you will have to draw this in 2D Design!

Idea 1

Idea 2

Idea 3

Idea 4

Idea 5

Idea 6

Final Design

Final Design - Describe how well your final design meets your specification

D&T : Marking Summary : Designing

	Descriptor	Tick Box Student	Tick Box Teacher
Working	You have produced a specification which covers most of the requirements with some explanations. You have put together, with help, a working PCB. You have developed a limited range of ideas for the case base.		
Secure	You have produced a detailed specification which covers the general needs and requirements. You have assembled independently a fully working PCB. You have developed a range of ideas for the case base.		
Confident	You have produced a full and detailed specification covering all the key points with a detailed explanation for each point You have independently assembled a working PCB and you understand how it works. You have developed a good range of ideas for the case base.		

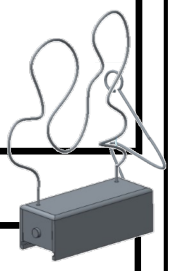
Student Next Step:

Designing

This work is

Below / On / Above / Well above

your minimum target path



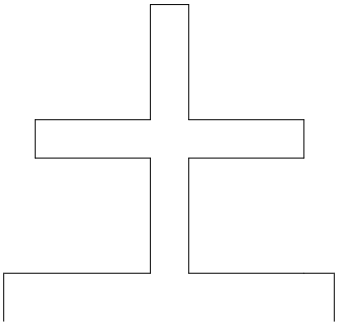
Final CAD of Steady Hand Game Side Panel

Adapt your drawing of the base in 2D Design to include your final design. Paste your final design here once you have checked it with your teacher and it has been sent for machining on the CNC Milling machine.

Peer Assessment of Design Work so far: Discuss your idea in groups and show notes below of the feedback given

Generating Ideas

Using as many of the themes from page 2 as you can, sketch shapes for your final wire design. Develop each shape by drawing variations on the same theme. Comment on which might be more suitable for the wire maze and why. Fill the page.... *This is the page to show how creative you can be! Remember your Design Specification...*



Wire in the shape of the medical red cross.

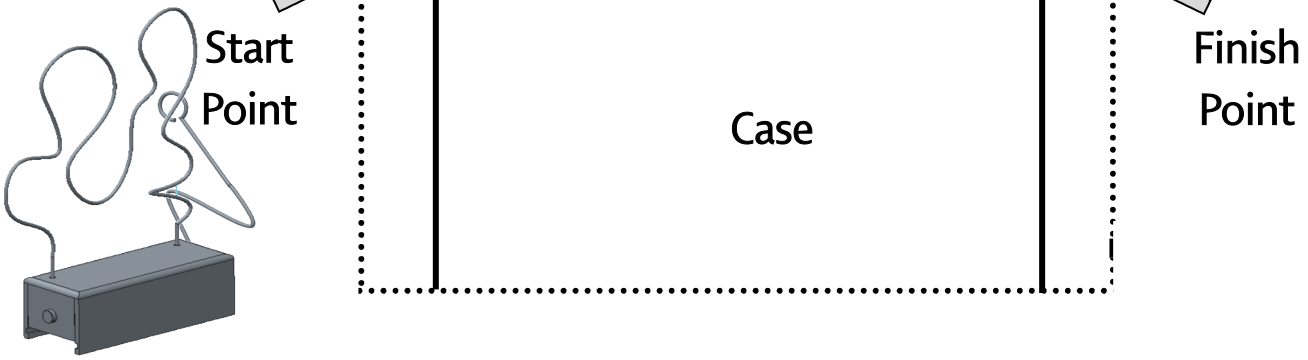
Working Towards: Produced a range of different shapes with annotation

Secure: Has produced variations on each shape with some explanation of thinking

Confident: A large variety of shapes with variations on each and extensive annotation and reasoning.

Homework 4

Final Design Layout. Draw out extremely carefully your final design layout. The design must start at the start point and finish at the finish point. The design must not go outside the dotted line. This design will be used as a pattern to make your wire, so accuracy is very important.



D&T : Marking Summary : Designing

	Designing	Tick Box: Student	Tick Box: Teacher
Working Towards	You have produced a range of different shapes with annotation. You have used CAD with help and the use of templates to develop your sliding base and PCB layout.		
Secure	You have produced variations on each shape with some explanation of thinking. You have used CAD with some assistance to develop the layout of your sliding base and a compact PCB layout.		
Confident	You have produced a large variety of shapes with variations on each and extensive annotation and reasoning. You have used CAD independently to develop a working sliding base and a compact PCB layout.		

Teacher Feedback:

Designing

This work is

Below / On / Above / Well above

your minimum target path

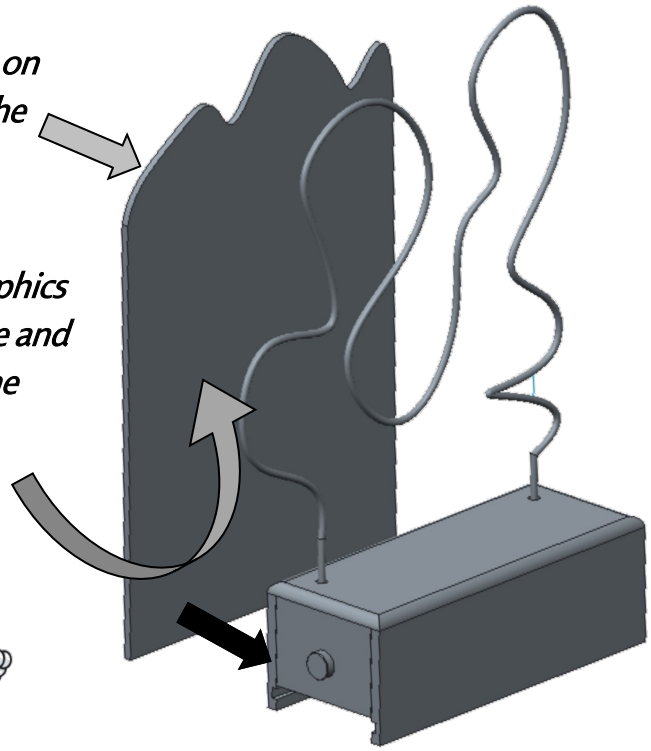
Background & Instructions

You need to use the next page to design a suitable background board for your Steady Hand Game. You need to consider that it will have to be the appropriate size for the case and wire,. You also should reflect on the theme and specification you have chosen for your design. The Board can be shaped in the top section but the base should remain the same shape as the case.

On the reverse of the board you need to develop some instructions for the games use. Remember that your user might not be able to read, so the use of simple language and pictures is required.

Instructions on the rear of the backboard

Suitable graphics for the game and theme on the front of the backboard



Use 2D Design to draw your final Backboard on.

If you set the page size to match the printer before you start by going to 'Setup—Drawing—Layout'.

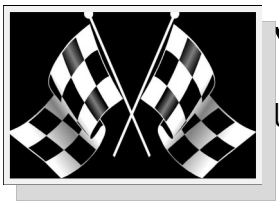
Then draw on the page a rectangle that is 100mm wide and 175mm tall. Your backboard must fit onto this size.

Then copy the outside shape onto a new page, flip the outside shape horizontally to give you the shape fo

Design For Backboard : *Remember the notes on the previous page*

Design for Instructions : *Remember the notes on the previous page*

Hint: to get a better level, try to remember the audience you are designing for. Is your design appropriate for them?



Your Final Steady Hand Game

Use this space to annotate a range of photos of your final product.

Peer Assessment

Peer assessed

What do your Peers think of your final product. Comments must be positive, and also suggest improvement that could be made.

Comment 1

Comment 2

Homework 6

In the space below, complete an evaluation of your Steady Hand Game.

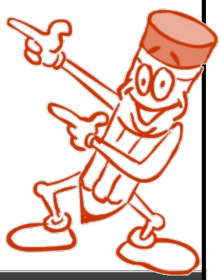
Did you complete Steady Hand Game? If yes, how did it go? If no, why do think you did not complete it?

What was the hardest part of the project and why?

What have you learnt from doing this project? How well does your design meet your Design Specification?

How independently have you worked? Do you think your Peers suggestions for improvement are valid and what would you do to improve your project?

What was the best part of the project? And why?



Working Towards: Some attempt to evaluate through analysis but states the obvious.

Secure: Good use of analysis to judge critically how well the clock meets the brief and specification.

Confident:A range of evaluation techniques are evident. Suggestions for improvements are valid.

D&T : Marking Summary : Making & Evaluation

	Making	Evaluating	Tick Box Student	Tick Box Teacher
Working Towards	• With help, where needed, use equipment, tools and materials • Produce a suitable finished product.	• Make a simple judgement on the final product/outcome • Make simple suggestions for improvement.		
Secure	• Manage short tasks independently (without help from the teacher) • Produce a good quality finished product	• Identify what worked well and what could be improved • Evaluate research		
Confident	• Select & use a range of tools and equipment • Work accurately • Pay attention to the quality of final product • Produce a well-designed product.	• Compare design ideas/final product against the design brief criteria • Suggest improvements for design ideas/ product • Gain technical information from examining, describing and evaluating similar products		

Making

This work is

Below / On / Above / Well above

your minimum target path

Evaluating

This work is

Below / On / Above / Well above

your minimum target path

Re-Write a Section

Use the page below to Re-Write a Section if required. Remember to label which section it is for!

D&T Across the Curriculum

Resistance (R) = Voltage (V) / Current (I)

Ohm's Law defines the relationship between Voltage, Current and Resistance in a circuit. It can be written as a mathematical expression:

Resistance is measured in Ohm's (Ω), Voltage is measured in Volts and Current is measured in Amps.

If for example, Voltage is given in Volts and Current is given in milli Amps (mA), then Resistance will be in K (thousand of ohms).

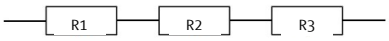
Literacy—Key Words

The page below is to list Key Words and their correct spelling.

Extension Task: ***Try to work out the resistance in the Series and Parallel calculations below:***

Resistors in series

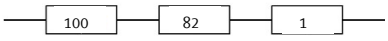
When resistors are connected one after each other this is called a series connection. This is shown below:



To calculate the total overall resistance of a number of resistors connected in this way you add up the individual resistances. This gives the following formula:

Rtotal = R1 + R2 + R3 and so on

Example: To calculate the total resistance for these three resistors in series:

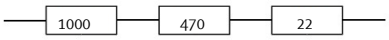


Rtotal = R1 + R2 + R3

= 100Ω + 82Ω + 1Ω

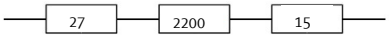
= 183Ω

Task 1: Calculate the total resistance of the following resistors in series:



Rtotal = ...

= .....

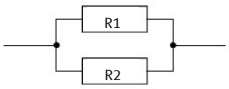


Rtotal = ...

= .....

Resistors in parallel

When resistors are connected across each other (side by side) this is called a parallel connection. This is shown below:

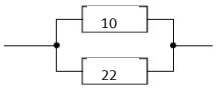


Two resistors in parallel

To calculate the total overall resistance of two resistors connected in this way you can use the following formula:

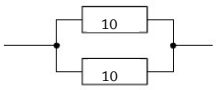
$$Rtotal = \frac{R1 \times R2}{R1 + R2}$$

Example: To calculate the total resistance for these two resistors in parallel



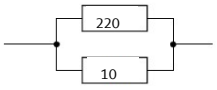
$$Rtotal = \frac{R1 \times R2}{R1 + R2} = \frac{10 \times 22}{10 + 22} = \frac{220}{32} = 6.88$$

Task 2: Calculate the total resistance of the following resistors in parallel



Rtotal = ... = ... = ... = ...

..... = ... = ...



Rtotal = ... = ... = ... = ...

..... = ... = ...

Acrylic	Board	Computer	Ohms	Series	Thermosetting
Aided	Buzzer	Current	Parallel	Solder	Thyristor
Alloy	Circuit	Design	Pliers	Strippers	Track
Amps	CNC	Iron	Printed	Switch	Voltage
Battery	Component	Memory	Resistor	Thermoplastic	Wire