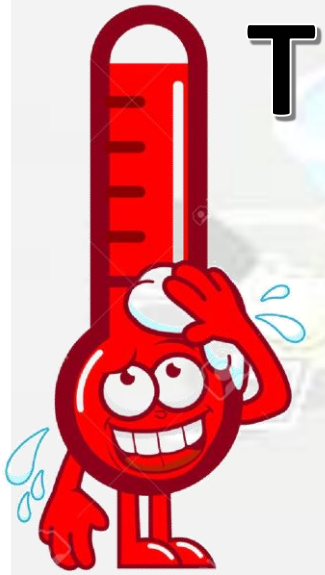
Name:		D&T Group:	
Teacher:		Tutor Group:	



The Heat Is On!

Subject: Design & Technology

Progress band target: _____

This is the target for the end of Year 11.
Targets will become more specific as you move up the year groups.
Your work will be marked as:
Below / On / Above / Well Above
the path to this target.

Homework

Homework 1: Page 19 - Research – use the space to conduct any research that you think might be needed in order to help you design your final thermometer and its programming.	**Homework 4:** Pages 12 & 13 – Complete the range of design ideas started in lessons for the case of your thermometer, using only card as the material.
Homework 2: Page 6 - What is a microcontroller – try to research what a microcontroller is and describe it, as best as you can, in your own words, using the space provided.	**Homework 5:** Page 14 - Draw a final Presentation Drawing of your idea. Try to draw it in Isometric and use the 'thick and thin line' technique to enhance the design.
Homework 3:. Page 15 - Research as many careers that require you to program electronics or computers... How many can you find? Complete the brainstorm of jobs!	**Homework 6:** Page 18 – Complete the evaluation splurge started in the lesson. Remember to try and record feedback from others and how you might improve your work.

Marking Summary

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

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

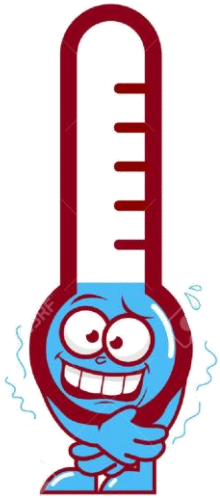
Overall Project

This work is
Below / On / Above / Well above
your minimum target path

Design Brief: The story so far...

Bowie's Specialist Thermometers manufacture high quality, bespoke, Thermometer's for specific markets / users. The designs and images are contemporary, modern, with a humorous twist.

The product incorporates an electronic thermometer that monitors the temperature of a specific environment. It notifies the user if the temperature is correct, too hot or too cold. This thermometer is controlled by a PIC Microcontroller that is programmed specifically for the unique product.



Mind Map (Brainstorming Market & Environment)

Task:- Use the space to the left to Brainstorm with your peers about who you might design a thermometer for and also where they might want to use it.

Possible users / environments for my bespoke thermometer

Task:- Compose your own project Design Brief in the space below, try to list some of the wants and needs from the information above. Remember that a brief is an outline of what you are intending to do.

Example Brief:- 'I am going to design and make a Thermometer for my Grandad to use in the Greenhouse to see if it is at the correct temperature.

.....

.....

.....

.....

.....

Research Plan: What Am I Going to Need to Know about my target market and Environment?

⇒

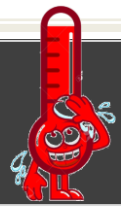
⇒

⇒

⇒

⇒

⇒

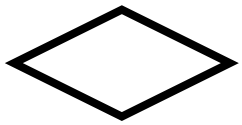


Flowcharts

We are going to be designing and making an electronic thermometer this term. This is going to involve you programming microcontroller electronics and making a case. Programming is mathematical and can be complex. The best place to start thinking about programs is to learn how to create a flowchart.

A flowchart is a plan that shows you how to make something. It breaks the making process into steps. Tasks are sequenced in order. It helps you plan ahead, getting materials when they're needed. There are different symbols representing different stages.

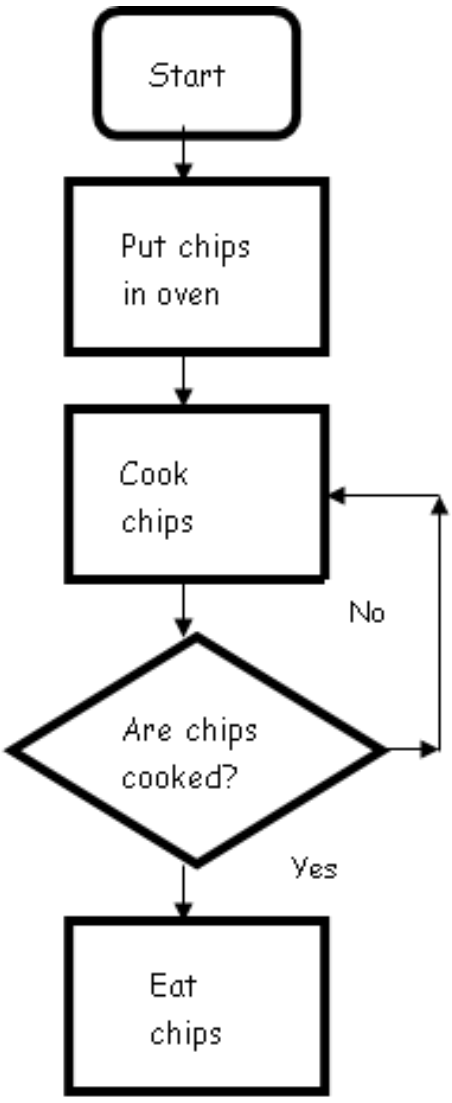
Start / Stop



Decision / Question

Process

Flow line



Exemplar Flowchart

This flowchart represents cooking chips in the oven.

The first **process** after the **start** is to put the chips in the oven.

The second **process** is to cook the chips. A process is an instruction or an action.

The **decision** box asks if the chips are cooked, if the answer is yes then you can eat them, if not, there is a **feedback loop** which lets you go back and cook the chips until they're done. As you can see a decision is a choice or a question that you answer yes or no to.

The last process is to eat the chips and then the flowchart **stops**.

Use the space below to construct a flowchart on 'How to make a cup of tea?'

Remember – you might need to ask the question about how many sugars, if any, they may want or if they would like milk or not!

START

Final Thermometer Program

Using PICAXE Editor on the computers you need to create the basic starting program outlined in the flowchart below. This program reads the number that is generated from the Thermistor in your circuit board, depending on the temperature and compares it in the flowchart. The number comes into the PIC microcontroller to a pin labelled C4. Depending on C4's value, it will direct which way the flow goes in the flowchart and therefore which output is switched on.

Degrees Celcius	PIC Number into C4
0	18
1	19
2	20
3	21
4	22
5	23
6	24
7	25
8	26
9	27
10	28
11	29
12	30
13	31
14	32
15	33
16	34
17	35
18	35
19	36
20	37
21	38
22	40
23	42
24	43
25	45
26	46
27	47
28	48
29	50
30	52
31	54
32	56
33	58
34	60
35	62
36	64
37	66
38	68
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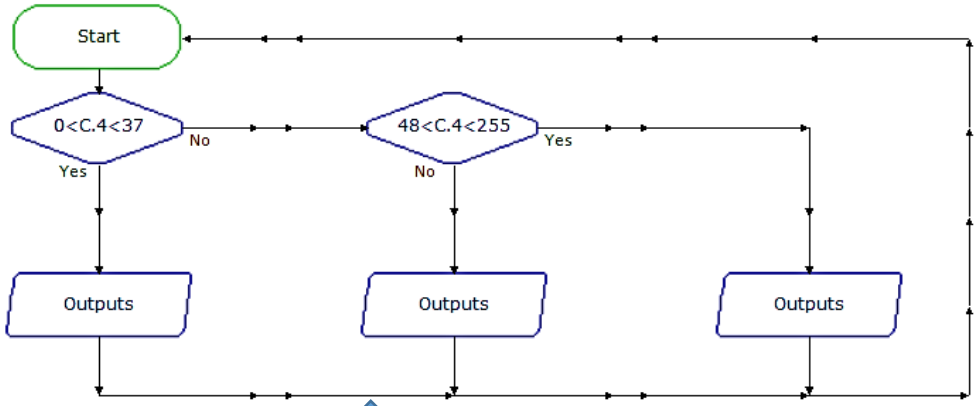
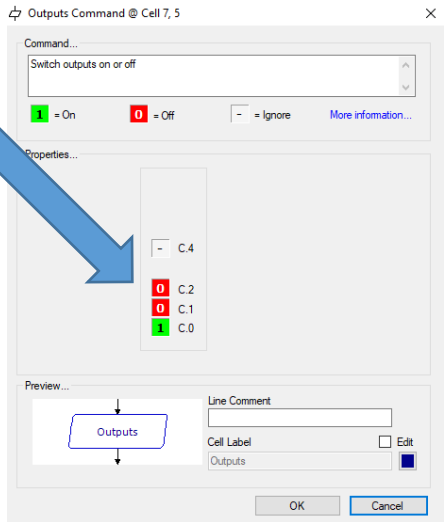
42	78
43	81
44	84
45	87
46	90
47	93
48	95
49	98
50	101

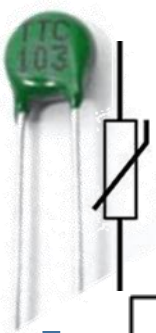


Each output is connected to a different coloured LED. By turning 'on' one output and turning 'off' the other two, it will change the LED depending on the number coming from the Thermistor on C4.



Thermistor – .....

.....



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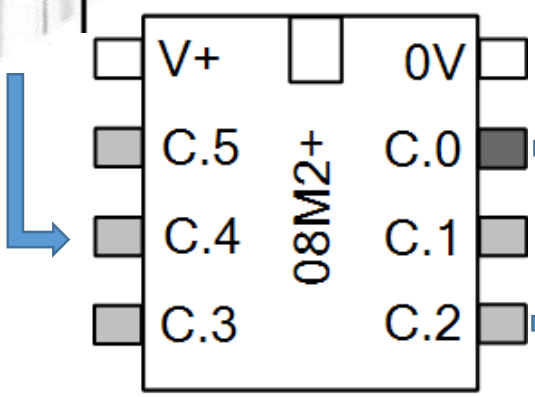
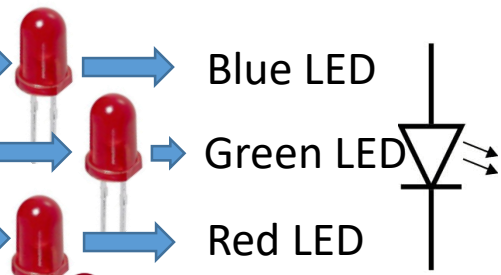
PIC Microcontroller



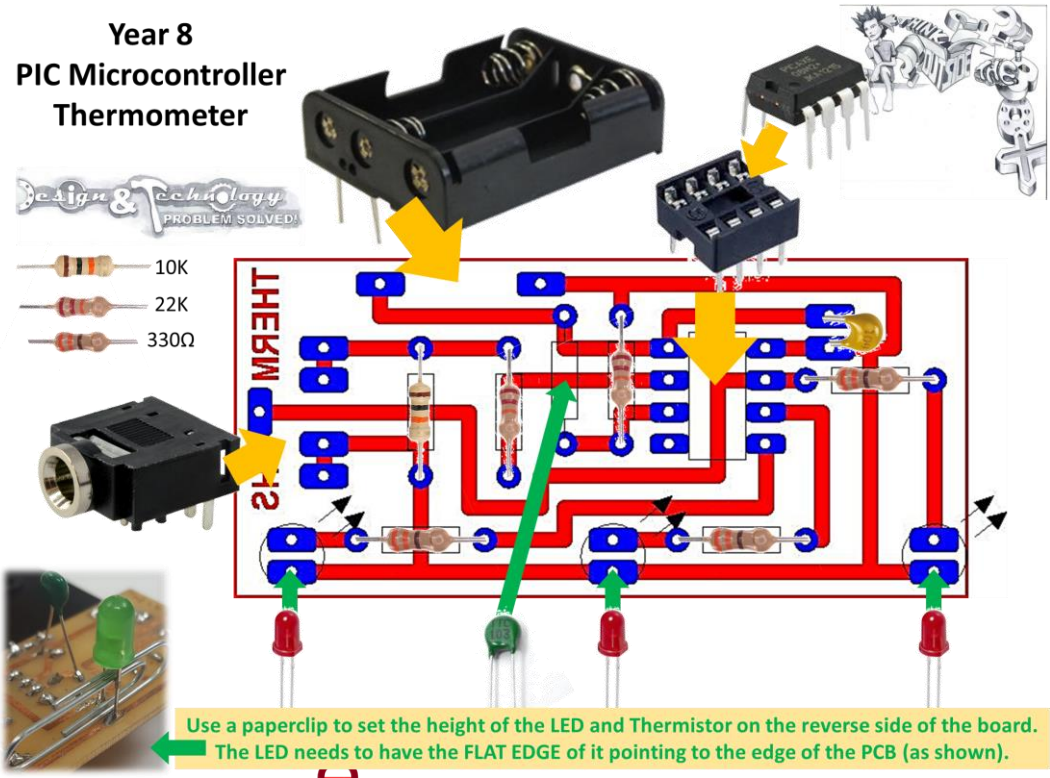
LED - .....

.....

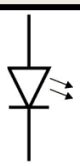
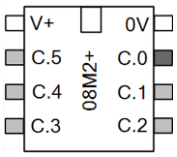
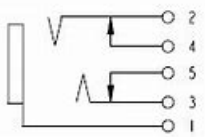


Homework 2

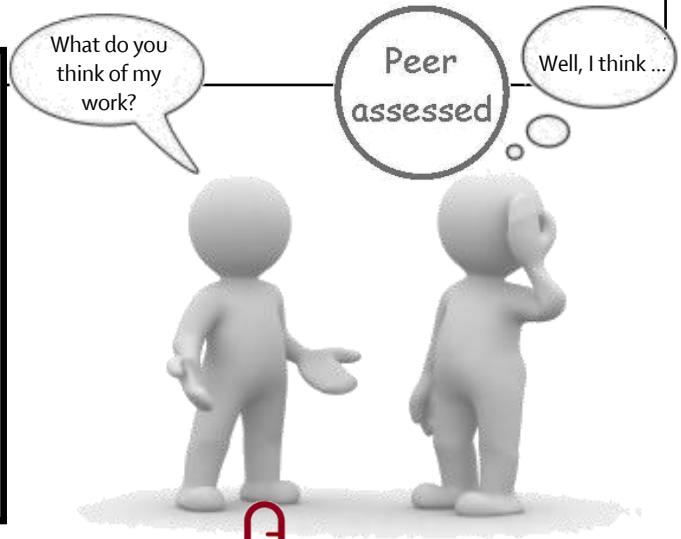
What is a microcontroller – try to research what a microcontroller is and describe it, as best as you can, in your own words, using the space below.



Your final PCB has been assembled using the layout shown here. Fill in the table on the right to identify and describe the components used.

Component Symbol	Component Name	Description Of What The Component Does
		
	Thermistor	
	Battery	
		
	Resistor	
		
		This is a temporary store of electrical energy. It is like a bucket with a hole in it; it fills with electricity then slowly releases it again in a controlled manner. It is measured in Farad's. It can be used to smooth out electrical spikes and store electricity for short times.

Personal evaluation of your work so far having marked it in lessons with your teacher and peers:



Gosub	The symbol for jumping to a mini bit of program called a procedure. It will do the program there then jump back to this point.	Analogue	Use this command to read the input connected to an identified pin (leg) on your PIC and then ask a question about it.
	This is the start of a new mini program, called a procedure, where you can do a bit of program then jump back to your main control program.	Expression	Set a value (number) into a file.
Return	To end a procedure and jump back you use the return command. This will end your procedure and return you to where you left your main control program.	Inc	Add one to the value (number) you have created in a certain expression file.
Wait	You can use this to pause your program for a set length of time in seconds.	Compare	Ask a question about the value you have got in an expression and decide which direction to go – Yes or No…

Use these two pages to design your program for your thermometer. ***Remember*** to use a control program and procedures to run mini sections of program:

Technical Knowledge

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

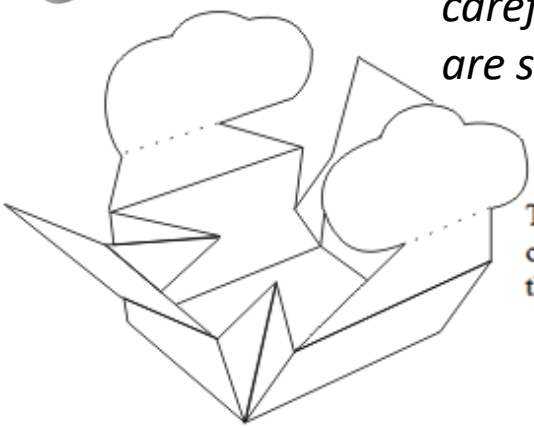
Teacher Feedback:

Use this page to stick in a final print out of your Thermometer program that you have downloaded onto your PIC microcontroller…

Well done!

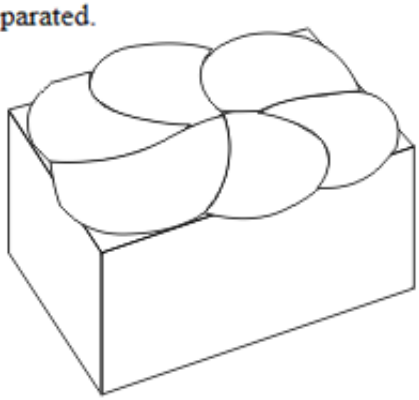
Card Nets

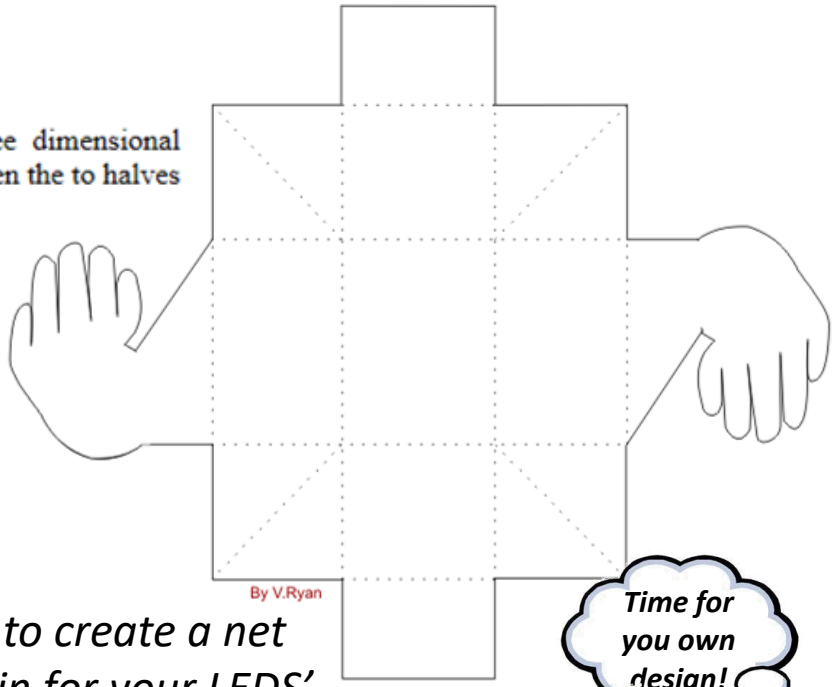
Have a go at making the flower box with the sheet provided. Be careful to follow the lines carefully. Solid lines are cut lines, dotted lines are score lines. Only the accurate will succeed.



The diagram opposite shows how the development / net of the flower box is folded. When held together by the lid, the box forms a fairly solid shape.

The two halves of the lid hold the three dimensional package together. The box comes apart when the to halves are separated.





Use layout sheets provided to create a net with the appropriate holes in for your LEDS' and thermistor to show through.

Thermometer Case Design Specification:

-
-
-
-
-
-
-
-

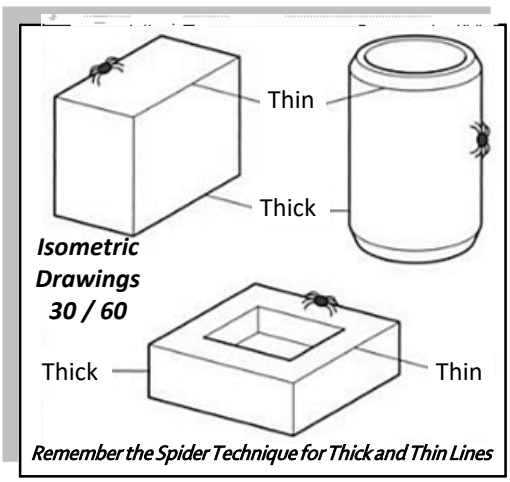
CONCEPT IDEAS

On these two pages you need to come up with some ideas for what your final design will look like. Try to use 3D sketches to show your ideas to gain higher levels. Use colour where possible!

Remember: designs should include information such as notes, sketches, materials, evaluation and thoughts

Homework 5

Draw a final Presentation Drawing of your idea. Try to draw it in Isometric and use the 'thick and thin line' technique to enhance the design. Include annotation notes and peripheral sketches to show information and detail about materials and construction. Some idea of sizes are important too...

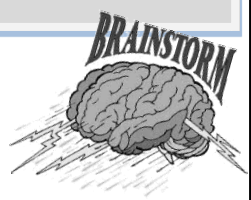


Designing

This work is
Below / On / Above / Well above
your minimum target path

Homework 3 - Links to Careers and SMSC

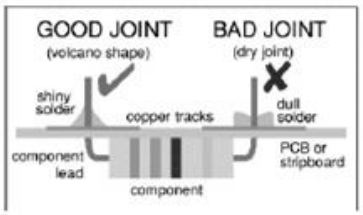
Research as many careers that require you to program electronics or computers... How many can you find? Complete the brainstorm of jobs!

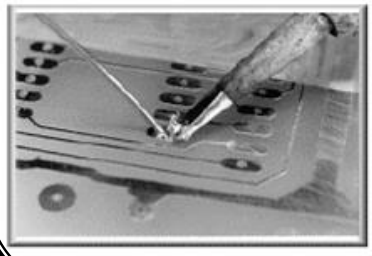


Mind Map (Brainstorming Careers that programming electronics or programming computers)

Self / Peer Assessment

THE RULES OF SOLDERING





- Hold the soldering iron like a pen, near the base of the handle. *Imagine you are going to write your name. Remember to never touch the hot element or tip.*
- Make sure that your soldering iron is clean. *Clean the tip of the hot soldering iron on a damp sponge.*
- 'Tin' your soldering iron. *Melt a small amount of solder onto the tip of the soldering iron.*
- Touch the soldering iron onto the joint to be made. *Make sure it touches both the component lead and the track. Hold the tip there for a few seconds and...*
- Feed a little solder onto the joint. *It should flow smoothly onto the lead and track to form a volcano shape as shown in the diagram. Apply the solder to the joint, not the iron.*
- Remove the solder, then the iron, while keeping the joint still. *Allow the joint a few seconds to cool before you move the circuit board.*
- *Inspect the joint closely. It should look shiny and have a 'volcano' shape. If not, you will need to reheat it and feed in a little more solder. This time ensure that both the lead and track are heated fully before applying solder.*

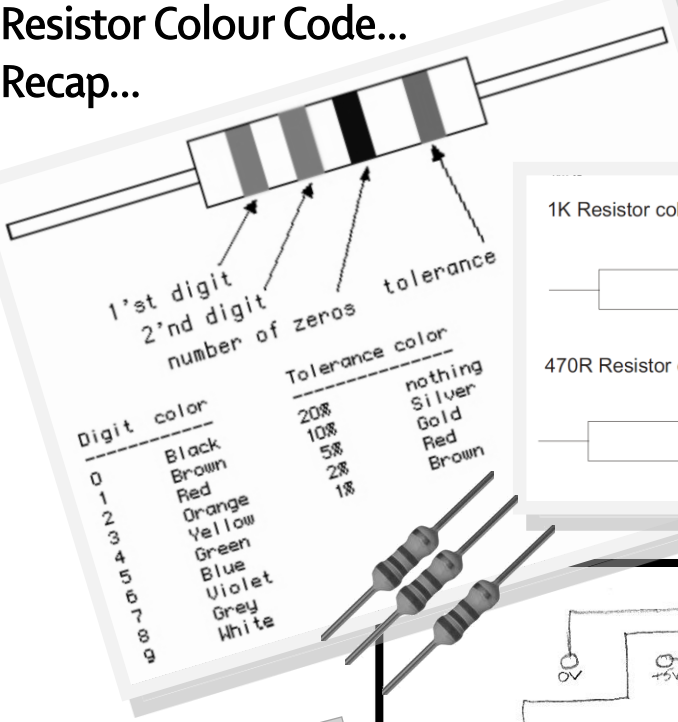
Extension task:

Try using 2D PCB which is a CAD package for developing electronic circuits to design your own PCB layout for the Amplifier circuit.

The circuit diagram on Page 4 and the layout above should help you with the task.

If you have the time then you could ask Mr. Dalton to help you make the board to use in your project!

Resistor Colour Code... Recap...



Have a go at working out the sizes of the resistors below?

1K Resistor colour code:

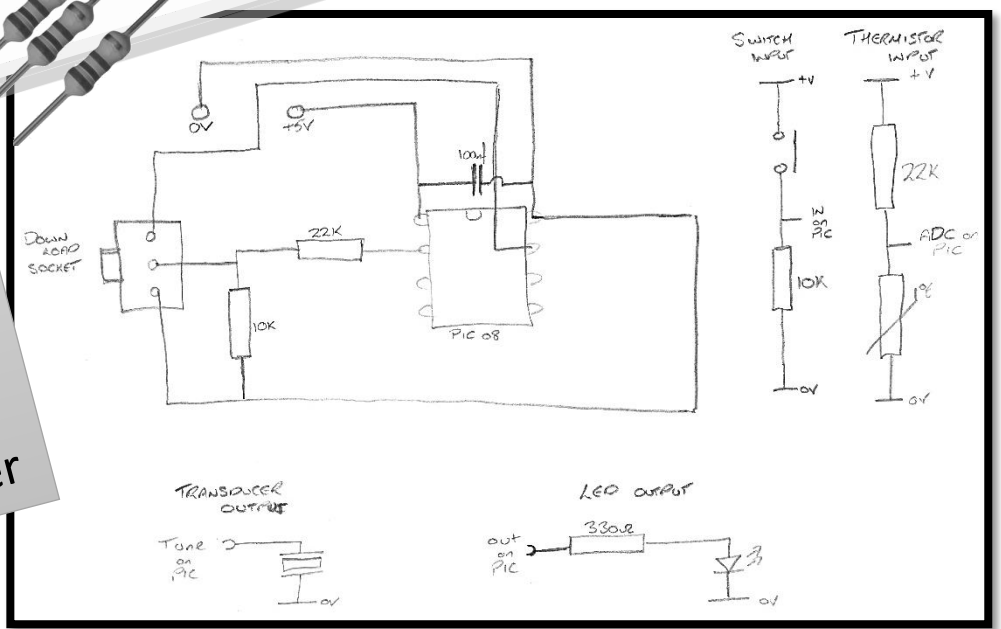
1R Resistor colour code:

470R Resistor colour code:

Current is measured in _____

Resistance is measured in _____

Capacitance is measured in _____



Starting point for designing a circuit that includes a PIC Microcontroller

17

Design & Technology

Design an electronic circuit for a bedroom burglar alarm using the PIC microcontroller circuit above as a starting point:

Maybe think about adding notes on a suitable flowchart for it, to make it work as intended.

Designing

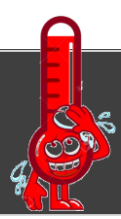
This work is
Below / On / Above / Well above
your minimum target path

Evaluation

Try to complete an evaluation splurge! Try to cram the page full of evaluation techniques that we have discussed… such as: surveys, personal thoughts, feedback from peers, user tests and results, modifications for the future etc… How full and informative can you make this page to reflect on your work?

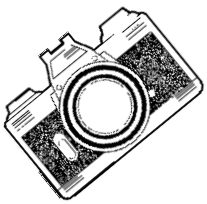
Evaluating

This work is
Below / On / Above / Well above
your minimum target path



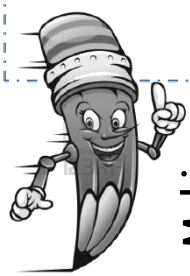
Homework 1 - Research

Research – use the space below to conduct any research that you think might be needed in order to help you design your final thermometer and its programming. You might need to think about what temperatures you need!



Print a photo of your final Thermometer and stick it below in the space provided:

Teacher Feedback:



Making

This work is
Below / On / Above / Well above
your minimum target path

D&T : Marking Summary : Making & Evaluation

	Making	Evaluating	Tick Box	
			Student	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		

Re-Write a Section

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

Literacy—Key Words

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

Don't forget to update your progress tracker!