KS4 Yr10/11 Product Design: *Engineering*

About me

NAME:

TEACHER:

TEACHING GROUP:

SCHOOL:

TUTOR GROUP:

What will I need to bring with me to each lesson?

Pencil
Black Pen
Ruler
Eraser
Calculator

Optional:

Colour pencils
Fine Liner
AQA D&T GCSE 9-1 revision book

Contents in this booklet:

Assessment When working in Design and Technology you will be levelled each half term for theory and coursework. An overall level recorded here. **Book work** will be marked in PINK (Progressive work) and Green (Target set) ***It is important to address the green.***

	YEAR 10			YEAR 11		
	theory	cwk	overall	theory	cwk	overall
1.1						
1.2						
2.1						
2.2						
3.1						
3.2						
END OF YEAR						

My Assessments:

TARGET LEVEL *Shaded below.*	**My Year 10 Projects in Engineering**		
9			
8			
7			
6			
5			
4			
3			
2			
1			
PROJECT TITLE			

HOMEWORK ASSESSMENT						
9						
8						
7						
6						
5						
4						
3						
2						
1						
	1Materials/Properties	2Manufacturing systems	3 Impact of technology	4Systems	5 Materials/Properties	6Testing
LITERACY ASSESSMENT						
MARK						
	1	2	3	4	5	6
NUMERACY ASSESSMENT						
MARK						
	1	2	3	4	5	6

NEA PROJECT ASSESSMENT SHEET (STARTS 1ST JUNE of YEAR 10)

Section A: Problem solving				
0	**1-5**	**6-10**	**11-15**	**Mark**
Nothing worthy of credit	The problem is accurately identified but inconclusively analysed.	The problem is accurately identified with most aspects of the problem having been analysed.	The problem has been analysed thoroughly, resulting in a comprehensive and accurate description of the problem to be solved Including consideration of relevant variables that may affect the engineered solution.	
Nothing worthy of credit.	A single method of solving the problem is generated. Choices are stated but not followed through sufficiently to solve the problem.	Consideration of other methods of solving the problem is limited to a single alternative suggestion with some detail, or a small number of methods that lack development. A mostly appropriate solution is chosen for further development.	A range of alternative, well-explained methods of solving the problem is considered in detail. Choice is justified with reference to the demands of the problem resulting in an appropriate solution being selected and developed fully.	
Nothing worthy of credit	Incomplete or partially effective modelling is demonstrated. An attempt at annotation of drawings/ modelling may have been made but it is not always clear from the descriptions or explanations that the ideas are workable.	Good modelling of several aspects of the development is demonstrated. Some drawings or records of other forms of modelling are annotated and it is clear from the drawings that the majority of ideas are workable.	Excellent modelling is demonstrated using a range of techniques including 3D, graphical and mathematical. All aspects are well-explained and Demonstrate that the final outcome Should function as desired.	
Nothing worthy of credit	Information is confused and not always presented in the most appropriate format. The reasoning behind why decisions were made is unclear.	Most information is organised and presented in an appropriate format. This conveys some aspects of decision making but not all choices are explained.	All information is consistently well-organised and presented in an appropriate format. All aspects of Decision making are well conveyed.	

Nothing worthy of credit	A prototype that does not function adequately has been produced.	A functioning prototype with some noncritical flaws has been produced.	A fully functioning and high quality prototype of the solution has been produced.	

Section B: Drawings and Conventions				
0	**1-5**	**6-10**	**11-15**	**Mark**
Nothing worthy of credit	Develops a solution using a limited range of engineering drawings.	Develops and partially evaluates an annotated solution using some engineering drawings.	Develops, justifies and evaluates a detailed and fully annotated solution that uses comprehensive and appropriate engineering drawings.	
Nothing worthy of credit	CAD has been used to attempt to present a limited amount of simple information about shape or size.	CAD has been used to present adequate information of shape and size or the function of components to allow development to progress.	CAD has been used, with effect, to produce accurate drawings of complex parts and rendered 3D presentations.	
Nothing worthy of credit	Drawings use conventions to a very limited extent or inaccurately.	Drawings generally conform to sector-specific standards and conventions with occasional errors or omissions.	Drawings consistently conform to sector-specific standards and conventions.	
Nothing worthy of credit	Drawings lack any annotation other than brief descriptions or labels.	Drawings have annotation for most important features, but lack sufficient detail.	Drawings are annotated clearly, accurately and appropriately, and are easy to follow providing all required detail.	
Nothing worthy of credit	Information is difficult to understand and lacks clarity.	Most information is presented in a clear manner. Some detail may be missing or be confusing.	All information is consistently presented in a clear and logical manner that ensures understanding.	

Section C: Production planning.				
0	**1-5**	**6-10**	**11-15**	**Mark**

Nothing worthy of credit	Followed a simple production plan using information contained within Engineering drawings or circuit diagrams.	Produced and followed a simple production plan using information Contained within engineering drawings or circuit diagrams.	Produced and followed a detailed production plan, covering most aspects of production using information contained within engineering drawings or circuit diagrams.	
Nothing worthy of credit	An outline plan that identifies limited aspects of production is provided.	A clear and detailed explanation of the main stages in the production of an engineered product is provided.	A comprehensive and detailed explanation of all of the stages in the production of an engineered product is provided.	
Nothing worthy of credit	Evidence of the use of a provided jig/ fixture or machining of a part on a CNC machine, using a provided program.	Evidence of the planned use of jigs, fixtures or CNC programming, to enable repeatable outcomes.	Planning includes detail related to the use of jigs/ fixtures to ensure repeatability. Detailed evidence that jigs or fixtures and/or CNC programming have been used.	
Nothing worthy of credit	Identifies the main process(es) and mentions the need for quality control when producing the product.	Identifies the main stages/ processes and an important quality control technique used to produce the product.	Identifies allstages and explains the sequence of processes and the quality control techniques used to produce the product.	
Nothing worthy of credit	Adheres to health and safety procedures.	Details the application of health and Safety procedures in the main processes.	Comprehensively details the application of health and safety procedures in all processes.	

Section D: Engineering skills used.				
0	**1-5**	**6-10**	**11-15**	**Mark**
Nothing worthy of credit	The outcome shows a limited amount of skill with little work completed accurately.	The outcome shows an acceptable level of skill across a number of processes, with most work completed accurately.	The outcome shows a high level of skill across a number of processes, with work completed accurately.	

Nothing worthy of credit number of Nothing worthy of credit	Used safely a very limited range of: • materials • parts • components • processes • tools • equipment.	small range of appropriate: • materials • parts • components • processes • tools • equipment.	Used safely awide range of appropriate: • materials • parts • components • processes • tools • equipment.	
Nothing worthy of credit	Applied quality control to a single stage. The engineered product is not made to any stated tolerances.	Applied the planned quality control to a limited number of stages. The engineered product is made within some of the tolerances stated.	Applied the planned quality control to all stages of manufacture to make their product. The engineered product meets the tolerances stated.	
Nothing worthy of credit	Makes an incomplete, low level of demand engineered product.	Makes an incomplete, high level of Demand engineered product **or** a complete low level of demand product.	Makes a complete, high-quality engineered product with a high level of demand.	
	The processes that have been used are stated.	Simple explanations of why particular Processes were used.	Clear and detailed explanations of which alternative processes were considered, justifying why particular methods have been used.	

Section E: Applying systems technology				
3-4	**5-6**	**7-8**	**9-10**	**Mark**
Displays a basic understanding of the systems technology used in the engineered product. Descriptions lack accuracy.	Explains in general terms a single systems technology used in the engineered product and how it operates.	Identifies and explains one or more systems technology used in the engineered product to organise and control the function of the product.	Identifies and explains in detail two or more of the systems and technologies used in the engineered product to organise and control the function of the product.	
A linear systems block diagram where more than one operation is described.	A systems block diagram, including an explanation of each of the blocks as a system	A complex block diagram for one or more systems with subsystems or feedback	Detailed block diagrams are produced for multiple systems with all sub-systems and	

1-2	or shown diagrammatically with explanation.	explained.	feedback explained.	
Shows a limited awareness of the systems technology used in the engineered product but descriptions lack any detail.				
A simple systems block diagram is produced consisting of a single input/process/output operational structure.				

Section F: Testing and evaluating				
3-4	**5-6**	**7-8**	**9-10**	**Mark**
Undertaken testing of limited aspects of the product with comparison to the product specification, using a single technique. Some quality issues addressed.	Undertaken a range of basic testing on the product using a variety of techniques comparing the results to the product specification. An explanation of the method used to ensure quality is maintained.	Undertaken appropriate testing of most aspects of the product and provided an informative comparison to the product specification. Quality control methods applied consistently to ensure all aspects of work are within tolerance.	Undertaken detailed and objective testing of all aspects of the product using a variety of testing techniques to compare with a comprehensive specification. An explanation of how quality is maintained through testing, detailing methods that ensure the work is within tolerance.	
A limited analysis and evaluation of an aspect of the completed product, stating why it needs to be improved.	An analysis and evaluation of the completed product, explaining why it needs to be improved.	A detailed analysis and evaluation of the completed product, explaining how and why either systems operation or manufacture could/needs to be improved.	A comprehensive analysis and evaluation of all aspects of the completed product, both systems operation and manufacture. Well-reasoned suggestions made for how and why possible improvements could be made.	
1-2	0			

Undertaken testing of a single aspect of the product with comparison to the product specification. Has a minimal awareness of quality issues.	Nothing of credit			
Limited analysis and evaluation of an incomplete product.	Nothing of credit			

NEA TEACHER FEEDBACK *Please address any GREEN comments*

Date	Mark Achieved	Comment

PROJECT 1

TASK OUTLINE: Manufacture of a storage system using a jig or template.

ASSESSMENT FOCUS: Engineering skills	1-5	6-10	11-15
	The outcome shows a limited amount of skill with little work completed accurately.	The outcome shows an acceptable level of skill across a number of processes, with most work completed accurately.	The outcome shows a high level of skill across a number of processes, with work completed accurately.
	Used safely a very limited range of: • materials • parts • components • processes • tools • equipment.	small range of appropriate: • materials • parts • components • processes • tools • equipment.	Used safely awide range of appropriate: • materials • parts • components • processes • tools • equipment.
	Applied quality control to a single stage. The engineered product is not made to any stated tolerances.	Applied the planned quality control to a limited number of stages. The engineered product is made within some of the tolerances stated.	Applied the planned quality control to all stages of manufacture to make their product. The engineered product meets the tolerances stated.
	Makes an incomplete, low level of demand engineered product.	Makes an incomplete, high level of Demand engineered product **or** a complete low level of demand product.	Makes a complete, high-quality engineered product with a high level of demand.

WWW

EBI

TEACHER COMMENT

STUDENTS THOUGHTS

☺

☹

PHOTO

PROJECT 2 Design and model an elctro-mechanical product.

TASK OUTLINE: Build an electronic system (KITRONIK) and incorporate it in a design of your own.

ASSESSMENT FOCUS: Drawings and conventions	1-5	6-10	11-15
	Develops a solution using a limited range of engineering drawings.	Develops and partially evaluates an annotated solution using some engineering drawings.	Develops, justifies and evaluates a detailed and fully annotated solution that uses comprehensive and appropriate engineering drawings.
	CAD has been used to attempt to present a limited amount of simple information about shape or size.	CAD has been used to present adequate information of shape and size or the function of components to allow development to progress.	CAD has been used, with effect, to produce accurate drawings of complex parts and rendered 3D presentations.
	Drawings use conventions to a very limited extent or inaccurately.	Drawings generally conform to sector-specific standards and conventions with occasional errors or omissions.	Drawings consistently conform to sector-specific standards and conventions.
	Drawings lack any annotation other than brief descriptions or labels.	Drawings have annotation for most important features, but lack sufficient detail.	Drawings are annotated clearly, accurately and appropriately, and are easy to follow providing all required detail.

WWW	STUDENTS THOUGHTS ☺	PHOTO
EBI	☹	
TEACHER COMMENT		

Select one of the products from the list.
Give the name of a specific material that they have created from and explain why this material has been selected (Justify)

Boat Hull
Phone body
Steel bridge
Aircraft skin
Formula 1 car body
Turbine blade
Tank
Racing cycle

Homework 1: *Materials and their properties.*

Homework 2: *Manufacturing systems*

Explain 3 different processes to cut metal in industry produce prototypes. 50 words and one diagram for each process.

Turning	Shaping
Milling	Piercing and blanking
Laser cutting	Shearing
Plasma cutting	Sawing

Impact of technology on our environment.

Research and develop a design for a product that would have a positive impact on the environment in your local community. The school, your park or your home. 150 words and one clearly annotated design.

Homework 3: *Impact of technology*

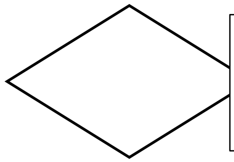
Homework 4: *Systems*

Draw a flow chart that shows the steps needed to make a card model of a chair. Use the correct symbols.

Shows the start or the end of the process

Shows where data is output or input is made.

Shows where an action is carried out



Shows where a choice is made

SMART materials. Research and investigate SMART materials. Write about two different SMART materials and explain how their special properties are being used to good effect. 150 words with one diagram

Homework 5: *Materials and properties.*

Flowcharts

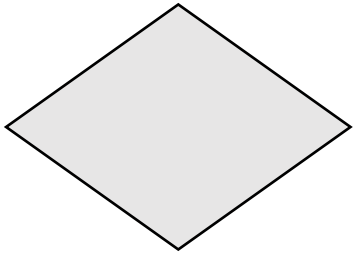
These are used to show the production system in diagrammatic form. A Flowchart is a universal system used to plan work for the manufacture of a product, it lists and puts into order the operations to be carried out during the manufacture of a product.

When you make a production plan flowchart there are specific shapes that you need to use on the flow chart. Look at the shapes on this page and familiarise yourself with what they mean. The diamond shape usually contains a question.

This shape shows a process carried out -

This shape shows the beginning and end of your production plan flow chart.

This shows a decision point/ quality control point, where the making is tested for quality and the production can either go on to the next stage or has to be repeated if not of sufficient quality.



Homework 5: *Flowcharts*

What points are in your **Manufacturing Specification**?

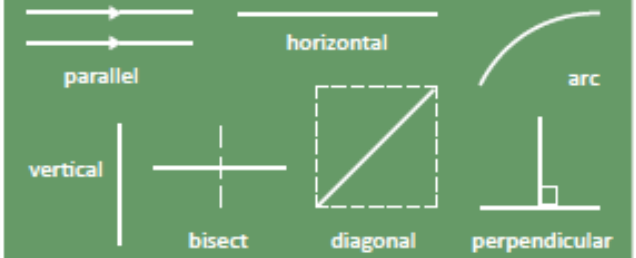
Test your final product against this specification. Does it do what the specification says.

Homework 6: Testing against the *Manufacturing Specification*

NUMERACY SUPPORT IN D&T

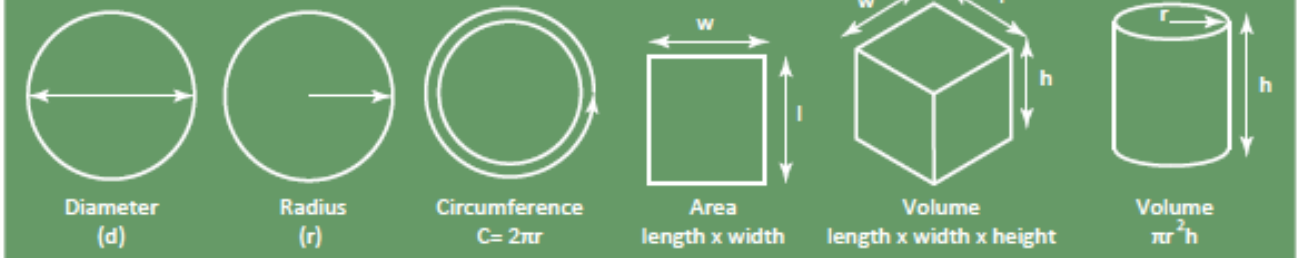
LINES

What do each of following lines mean



SHAPES

How to measure different shapes



Diameter (d)

Radius (r)

Circumference $C = 2\pi r$

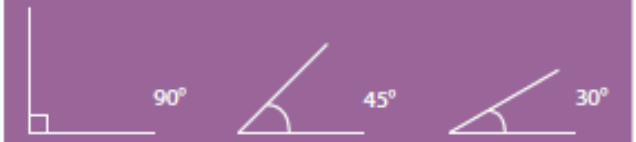
Area length x width

Volume length x width x height

Volume $\pi r^2 h$

ANGLES

Use the right tool to get the right angle



A **try square** is used to mark a 90° angle.

A **mitre square** is used to mark a 45° angle.

A **sliding bevel** is used to mark irregular angles.

MEASURES OF AVERAGES

This help you draw conclusions from data

The **mean** is the most common measure of average. To calculate the mean add the numbers together and divide the total by the amount of numbers:
Mean = sum of numbers ÷ amount of numbers

If you place a set of numbers in order, the **median** number is the middle one.

The **mode** is the value that occurs most often.

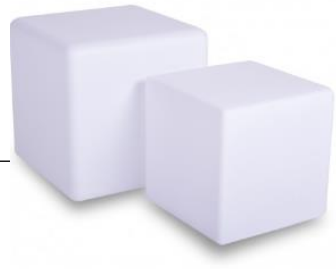
MEASURING

Measuring in millimetres is more accuarate than measuring in centimetres. In the workshop you will frequently use the steel rule.

1mm = 0.1cm
10mm = 1cm
50mm = 5cm
57mm = 5.7cm
100mm = 10cm

To convert mm to cm ÷ 10
To covert cm to mm x 10

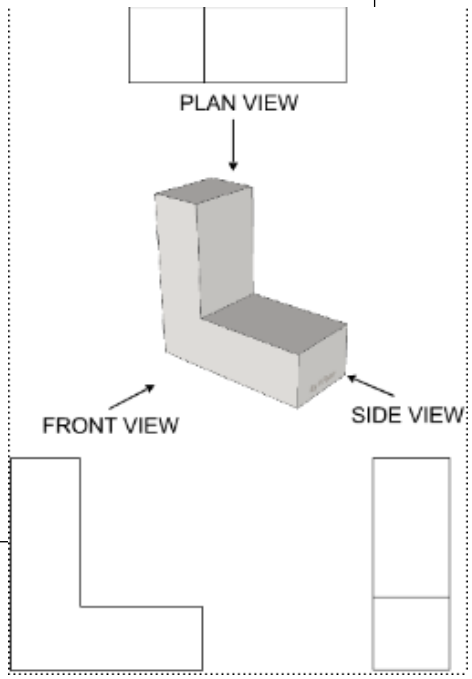
A Manufacturer is producing solid plastic cubes. Each cube is 30mm on each side. The manufacturer is using a polymer with a density of 960kg m^{-3}. *Calculate the mass of material needed to make 10 000 cubes. Assume that no material is wasted during the process*



Numeracy 1:

Produce a third angle projection of the following component. Include all sizes needed to allow manufacture of the component.

Photocopy of image from 173 theory book



Numeracy 2:

A company wants to produce a toy car for small children. They have asked you to generate a design idea.

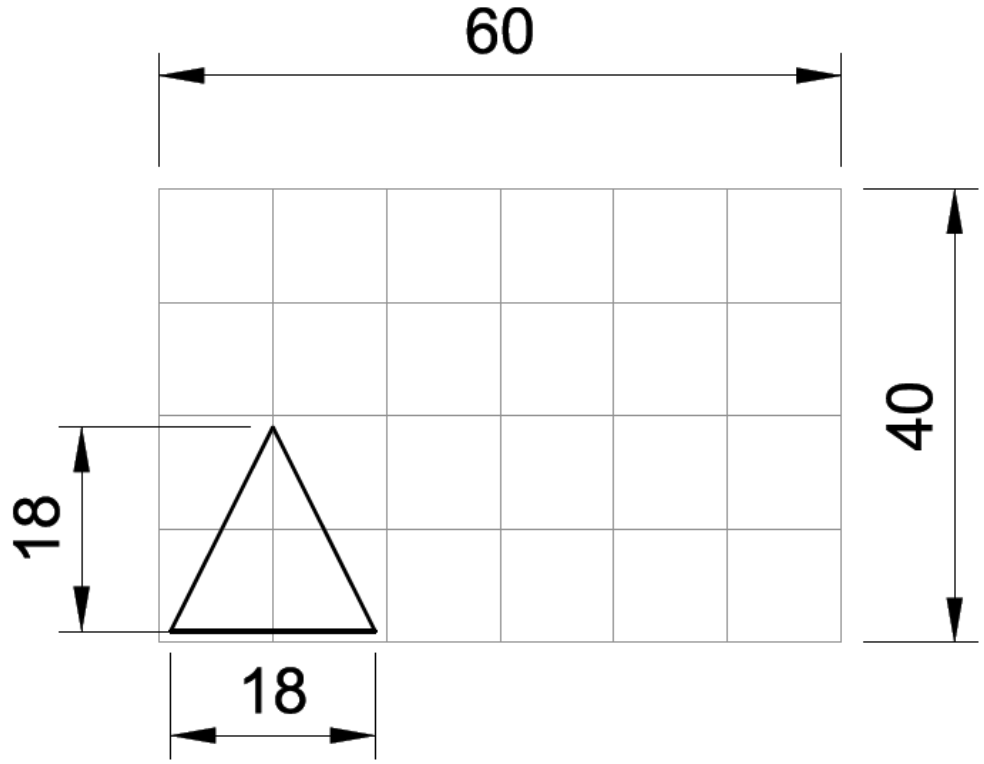
1. On the grid produce an isometric drawing of your design idea.
2. Annotate your design to indicate the main features including
    a. Sizes
    b. Materials
    c. Finish
    d. How it could be made

Numeracy 3:

The amount of renewable energy generated in 2015 was 83.3 Terawatt hours (TWh).
The ratio of solar power to other forms of renewable energy was 1:10.
What amount of energy was attributed to solar power?
Give your answer to 1 decimal point.

Numeracy 4:

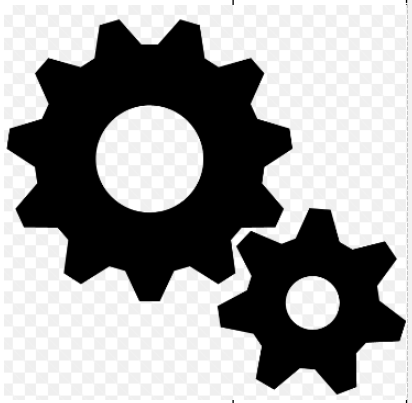
When packaging is cut out ‘nesting’ is used to ensure that minimal material is wasted.
A piece of material measures 60mm by 40mm. A triangle pattern measures 18mm (height) by 18mm (base).
The first triangle has been placed on the material. Repeat the triangle pattern to ensure that as many as possible fit on the material.



Calculate the amount of material wasted when producing the shapes you have drawn
Assume no material is wasted when cutting.

Numeracy 5:

Two gears similar to those shown are being used to transfer motion in a mechanical device.
The input (driver) gear is turning clockwise. What is the direction of the output (driven) gear?



Imagine that the input gear has 12 teeth and the output gear has 36 teeth. Calculate the gear ratio.

Numeracy 6:

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.
CAD/CAM	*Describe what is meant by CAD. GIVE EXAMPLES IN YOUR ANSWER*
	Describe what is meant by CAM. GIVE EXAMPLES IN YOUR ANSWER

Literacy 1:

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.	Literacy 2:
PLANNED OBSOLESCENCE	*Describe what is meant by PLANNED OBSOLESCENCE*	
	Explain why companies produce products with planned obsolescence built into their life cycle	

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.
DEFORESTATION	*Define the term deforestation*
	What are the negative impacts of deforestation?

Literacy 3:

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.
CROWD FUNDING	*Describe what is meant by crowd funding*
	Explain the advantages and disadvantages of crowd funding

Literacy 4:

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.
TOLERANCES	*What are tolerances?*
	Explain why tolerances are used in product manufacture.

Literacy 5:

Keyword	USE FULL SENTENCES IN YOUR ANSWERS.
ITERATIVE	*Describe the iterative design process*
	Discuss the advantages and disadvantages of using the iterative process to design products

Literacy 6: