TECHNOLOGY

Processing

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District D4

2009

Grade 8

Learner _____

Teacher ____ _____

PROCESSING													Marks		
Date	Contents	LO 1 (S)					LO 2 (K)			LO 3 (V)			LO 1	LO 2	LO 3
		AS 1	AS 2	AS 3	AS 4	AS 5	AS 1	AS 2	AS 3	AS 1	AS 2	AS 3	Skills	Knowledge	Values
Investigate:															
	Case Study 1: Combination of textiles	#				#					#				10
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	Resource Task 1: Origin of materials	#						#						10	
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Design															
	Design Brief		#				#						5		
	Specifications		#				#						5		
	Possible ideas		#			#	#						10		
	Final design		#			#	#						10		
Make:															
	Planning			#		#	#						10		
	Project: Portfolio file			#			#						35		
Evaluation:															
	Strong & weak points				#		#						5		
	Improvements & changes				#		#						5		
Tests															
	Test	#						#						40	
	Total:	#	#	#	#	#		#			#		**100**	**50**	**25**
													÷ 2	÷ 2	
													50	**25**	**25**
													Total:		**/100**

CAPABILITY TASK

In this module you are going to make a portfolio file in which you can keep your Technology documents. You will use the knowledge you will obtain about materials and the processing thereof in order to comply with the given specifications.

The portfolio file must:

- be strong / resist forces
- durable / last long
- keep your portfolio document neat and dry
- be at least 350 x 250 x 60 mm
- be made of recycled paper / cardboard

To help you with your capability task you will complete Resource Tasks and Case Studies.

INVESTIGATE

Since the earliest times people used different materials to make articles. Cothes were made of animal skins, hammers were made of sticks and stones. Over the ages people learnt how to process materials to fulfill certain needs. Bones and stones were sharpened against rough surfaces to make knives and needles. Textiles were woven from wool. The development of technology created thousands of processing possibilities. Nylon is one of the first sinthetic textiles which today has countless uses.

We are going to investigate different materials and how it can be processed to enhance its properties or to adapt it for specific uses.

Materials

Materials can be natural or manmade. Natural materials come from plants, animals or minerals.

Resource Task 1:

Date: _____

Place a checkmark in the correct columns to indicate where each material originates from. (Each material will have two checkmarks)

Material	Natural	Manmade	Plant	Animal	Mineral
plastic					
copper					
leather					
glass					
pine wood					
chipboard					
rubber					

wool					
Stainless steel					
fibre glass					

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Resource Task 1	Assignments completed and correct. Obvious effort.	Assignments completed and correct. Some effort.	Assignments completed haphazardly. Hardly any effort.	Assignments incomplete. No effort.	**____ 10**

Properties of materials

One of the most important questions that should be asked, before a product can be made, is what material will be used. Materials are chosen based on their properties and the purpose for which the product will be used. You would, for example not use paper to make an umbrella, since an umbrella must be water resistant..

- **Stiffness**: how little distortion or deflection occurs when placed under pressure
- **Hardness**: Ability to withstand being scratched cut or dented
- **Brittleness**: When material fractures with little or no deformation
- **Toughness**: Resistance to impact
- **Ductility**: Allows a material to be elongated or stretched without breaking
- **Elasticity**: can be stretched out of shape, but will return to original shape.
- **Flexibility**: If a material bends easily and does not crack.
- **Plasticity**: After pressing or squashing a material the shape changes permanently.
- **Absorbent**: Materials that suck up water easily.
- **Waterproof**: Materials that seems to push water away, it just runs of the material
- **Corrosion resistant**: resists corrosion (rust) or UV-rays of the sun
- **Heat resistan:** will not burn or acts an insulator against heat
- **Conducts electricity**: lets electricity pass through it
- **Magnetic**: is attracted by a magnet
- **Transparant:** can see through it

Types of materials

Metals

Ferrous metals contain iron which rust and is magnetic. Examples: steel, iron
***Non ferrous met*als** contain no iron, do not rust and is not magnetic. Examples: zinc, copper, silver

When two or more metals are mixed it is called an alloy. Metals are alloyed to obtain properties which are absent from pure metals. Examples of alloys are; brass, a mixture of zinc and copper, stainless steel is a composition of carbon, chrome, nickel and magnesium. Bronze consists of copper and tin.

Wood

Timberwood is very expensive and since it is a natural resource we should not abuse it. There are plantations which are grown with the purpose of supplying wood for wood products and paper. At these plantations fast growing trees are planted.

The terms hardwood and softwood do not refer to the wood, but to the leaves of the trees: Softwoods come from trees with needle-like leaves; the most common types are pine, spruce and larch. Hardwoods come from broad-leaved trees; they include oak, ash and beech from the temperate zones, and a wide variety of tropical hardwoods such as mahogany, meranti and jelutong. Not all hardwoods are hard - balsa is very soft.

Manufactured board

Manufactured board is made by glueing together layers of woodfibres of veneers. It is usually made with leftover wood and has mainly been developed for industrial use, since it is possible to make many similar sheets of baord.

This type of wood is much cheaper than real wood, but because the appearance is not as attractive as the real thing, a veneer is often glued as a top layer.

Types of manufactured board are: plywood, laminated board, chip board, softboard, fibre board and softboard.

Composite materials

When two or more materials with different properties are combined, they form a composite material. The different materials work together to create a new material, which has the propeties of both. The two materials can clearly be distinguished in the new composite material.

Examples:

Mud and straw bricks

Humans have been using composite materials for a long time in order to build our dwellings. Some of the earliest forms of building were built of mud bricks. Mud bricks work well when they are being compressed (compression forces) but a cake of mud is easily broken if it is bent (bending forces). This is because the act of bending places a tension force on one edge.
At the same time as the mud block buildings were being built other people were making straw dwellings. Straw has a great deal of tensile strength (resistance to pulling forces) but it is very weak when crumpled. These early builders realised was that if straw, which has a good tensile strength was embedded in a block of mud, which has good compressive strength and left to dry the resulting brick would resist both tearing and squeezing. These composite bricks made excellent building materials.

Car tyres

Modern tyres are constructed of layers, which may include rayon cloth, steel bands and nylon belts all set in a matrix (binder) of rubber.

Concrete

Concrete is made from small stones and gravel called aggregate, sharp sand and cement. The small stone and gravel (aggregate) is the reinforcement and the cement is the matrix that binds it together. Concrete has good strength under compression but it is weak in tension. It can be made stronger under tension by adding metal rods, wires, mesh or cables to the composite. The concrete is cast around the rods. This is called reinforced concrete.

Veselglas

Consists of two distinct materials, a fibres of glass (ceramic), which is the reinforcement and a polymer resin called polyester, which serves as the matrix. The polyester resin polymer alone is brittle and has a low strength but when fibres of glass are embedded in the polymer it becomes strong, tough, resilient and flexible. It becomes an ideal material to make boat hulls, swimming pool linings, car bodies, roofing and furniture.

Textiles

Textiles have been used for clothes and shelters for hundreds of years. Much earlier animal skins and natural textiles like wool, cotton and silk were used. The development of technology has provided a great variety of manmade textiles for the modern day technologist. Examples are nylon, polyester, and acrylics.

Textiles are made by weaving or knitting fibres together, sometimes it is only squashed together and is kept together by the friction between the fibres. Some fabrics consist of layers which are bonded together and covered with plastic layer to make it water resistant. Strength of fabrics depends on the weaving methods and the type of fibre used.
Other properties which are of importance are flexibility, water resistance, ventilation, isolation against heat and cold, wind resistance, shrinking and stain resistance. The properties of fabrics especially the strength, stiffness and tear resistance depends on the direction in which the force is applied.

Compare properties of natural and manmade textiles:

Fabric	Absorbtion	Quick drying	Warm/ cool	Burns easily	Elastic	Wrinkles easily	Strong when wet	Cost
wool	high	no	warm	no	no	no	no	high
cotton	high	no	cool	yes	no	yes	yes	average
silk	high	yes	warm	yes	no	yes	no	high
linen	high	yes	cool	yes	no	yes	yes	high
Rayon viscose	high	yes	cool	Burns and melts	no	no	yes	low
Nylon & polyester	low	yes	warm	melts	yes	no	yes	low
acrylics	low	yes	warm	Burn and melts	yes	no	yes	low

Case Study 1:

Date_____

Textiles are often mixed which means that there can be natural as well as sinthetic fibres in clothes, carpets, curtains or upholstery.
Look at the properties of the different textiles mentioned above and then discuss the reasons for the following combinations:

Stretch denim: 98% cotton, 2% acrylics

_____

_____

Tracksuit: 69% cotton, 31% acrylics

_____

_____

Socks: 100% cotton

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_____

Carpet: 70% woo, 30% acrylics

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_____

Sofa: 70 % linen, 30% acrylics

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Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Case Study 1	Answers were logically planned and well structured and provide in-depth information	Answers planned that provide information to suit the aim of the task	Some answers were given but not all are applicable to the aim of the task	Incomplete or could not answer questions	**10**

Packaging

Thanks to modern technology and the discovery and development of different types of materials, packaging has improved vastly over the years, especially as far as food and perishable products are concerned, it is now much more convenient and safe.

Purpose of packaging:

- protects products against dust, moisture and bacteria
- Keeps the contents together for better transport and handling
- Gives information about the product, instructions, ingredients and sell by dates.
- Acts as advertisement to attract attention of possible customers.

Designing packaging for fruit juice containers:

Specifications for packaging:

- must keep light and oxygen out
- must provide resistance against transport and storing damage
- may not burst open or damage if it falls
- must pour easily
- may not be to expensive
- must be visible and attractive
- must preserve the product

Material which was chosen

Laminated cardboard boxes. The lamination consisting of:

- paper on the outside, since it can be printed and keep its shape.

- Polyethylene layer on the inside, because it is waterproof.
- Alumnium foil between the polyethylene and paper, because it does not let oxyten of light through.
- The cardboard is light, relatively cheap and can be shaped into a cube, which will take up little space when transported and on shelf displays.

Resource Task 2:

Date:_____

The packaging for breakfast cereals must also comply with certain criteria. Make a list of 5 specifications the packaging should fulfill.

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Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Resource Task 2	Assignments completed and correct. Obvious effort.	Assignments completed and correct. Some effort.	Assignments completed haphazardly. Hardly any effort.	Assignments incomplete. No effort.	___ **5**

The making of cardboard packaging

Cardboard packaging is usually made from a single sheet of cardboard which is then cut according to a pattern. Tabs are also cut out to attache the parts to one another. The shape is determined by scoremarks according to which the cardboard is folded.

Resource Task 3:

Date:_____

Find a small cardboard box like those used for medcine or quick soup. Carefully unfold the box and look at the pattern (also called the net or development)
Draw the net in the space below and use dashed lines to indicate folds. Also draw the box in 3-D as it looked before you unfolded it.

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Resource Task 2	Assignments completed and correct. Obvious effort.	Assignments completed and correct. Some effort.	Assignments completed haphazardly. Hardly any effort.	Assignments incomplete. No effort.	**____ 10**

Case Study 2

Datum:_____

Do research and find out what the following items were made of or covered with and why. If you have access to the internet, you can visit the given webpages to find the answers.

scuba gear (wetsuits)
http://www.adventureholidaytravel.com/divinggear.html
http://en.wikipedia.org/wiki/Wetsuit
http://www.surfing-waves.com/wetsuit.htm

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Firefighter clothing
http://express.howstuffworks.com/battling-blaze4.htm

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space shuttles
http://videos.howstuffworks.com/discovery/29171-assignment-discovery-space-shuttle-thermal-protection-video.htm
http://science.howstuffworks.com/question308.htm

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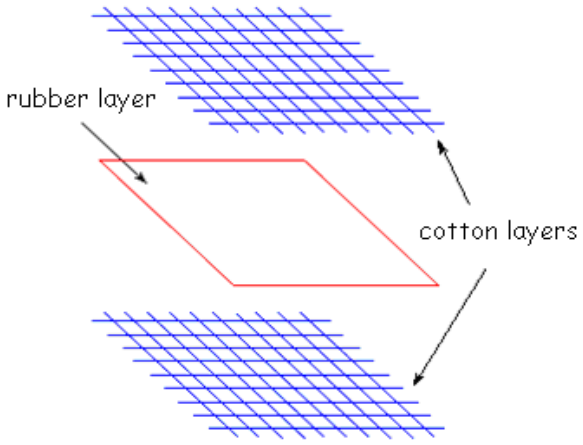
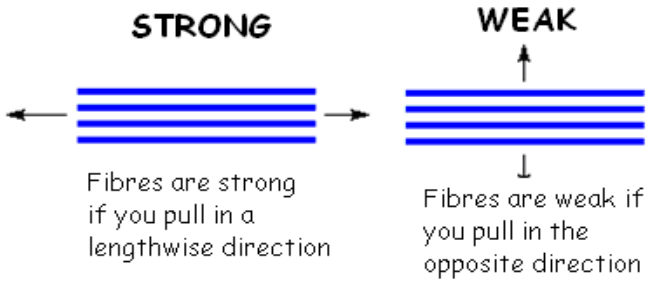
Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Case Study 2	Answers were logically planned and well structured and provide in-depth information	Answers planned that provide information to suit the aim of the task	Some answers were given but not all are applicable to the aim of the task	Incomplete or could not answer questions	___ **6**

Case Study 3

Date:_____

On microscopic level fabric consists of fibres. Different types of textiles consist of different types of fibres. The fibres in fabrics like cotton, which come from plants are called cellulose. Fibres from fabrics like wool and silk, which are from animals, are proteins.





Manmade fibres are called sinthetic fibres and is made of polymers.

Fibres are strong in tension but weak in compression. They are only strong across the length, if you pull at them across the width they will tear. (Test is for yourself with an old piece of cloth)

The answer to the problem is composite materials:

One of the first fibre reinforced polymer composite materials which were made is the raincoat. In the middle of the nineteenth century a Scot by the name of Charles Macintosh came up with a clever plan.
He took two layers of cotton and placed a layer of rubber in between. Contton is a fabric which is used for comfortable clothes and the rubber makes it waterproof. To this day raincoats are referred to as macintoshes in England.

1. What happens if you tear fabric lengthwise? _____

   _____

2. What happens if you tear fabric across the width? _____

   _____

3. How can you **reinforce** fabric? _____

   _____

4. What is the purpose of a raincoat? _____

   _____

5. What did Charles Macintosh use to make his raincoat waterproof? _____

   _____

6. What other methods can you think of to waterproof something? _____

   _____

7. Why do you think, did he use two layers of cotton? _____

   _____

8. How can you reinforce paper? _____

   _____

9. How can you waterproof paper? _____

   _____

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Case Study 3	Answers were logically planned and well structured and provide in-depth information	Answers planned that provide information to suit the aim of the task	Some answers were given but not all are applicable to the aim of the task	Incomplete or could not answer questions	___ **9**

DESIGN

Design Brief

Date:_____

_____

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Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Design Brief	Formulation of problem solving is clear and comprehensible.	Formulation of problem solving is reasonably clear	Formulation of problem solving is vague	Formulation of problem solving is incomplete and not relevant	___ **5**

Specifications

Date:_____

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Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Specifications	List of specifications complete and relevant.	Specifications complete	A few specifications were given	Specifications incomplete	___ **5**

Possible ideas

Date:_____

*Draw freehand 3-D representaions of **3 possible solutions** for the problem and briefly give pros and cons for each idea.*

Pros and Cons: _____

_____

_____

_____

Pros and Cons: _____

_____

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_____

Pros and Cons: _____

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Possible ideas	Ideas very neatly drawn, labels added. All pros and cons mentioned. Chosen idea very well motivated.	Ideas reasonably neatly drawn, labels added. Pros and cons mentioned. Chosen idea motivated.	Ideas not neatly drawn labels added. Few pros and cons mentioned. Chosen idea not clearly motivated.	Incomprehensible drawings of ideas. Pros and cons incomplete. Weak motivation of chosen idea.	**____ 10**

Final Design

Date: _____

Give final information regarding your product and make the required drawings.

Make a first angle orthographic drawing of your product and indicate dimensions.

Draw 3-D representations of your product. Make use of exploded drawings and labelling to explain your idea in detail.

Assessment					
Aspect	**Level 7** **(Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Final design	Working drawing and 3-D drawing is done and labeled.	Parts of the working drawing and 3-D drawing have been omitted.	Working drawing and 3-D drawing are incomplete.	Working drawing and 3-D drawing are neat and is labeled.	___ **10**

MAKE

Flow diagram

*Date:*_____

Draw a flow diagram to show your workmethod, time, tools equipment and materials.

Make a list of your equipment, tools and materials.

_____

_____

_____

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_____

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Flow diagram	List of tools and materials is detailed Flow diagram is logical and comprehensible.	List of tools and materials is complete Flow diagram is logical and but a bit sketchy.	List of tools and materials is not quite complete Flow diagram is not logical or comprehensible.	List of tools and materials is incomplete Flow diagram is incomprehensible.	**10**

Project

Date:_____

Paste a picture of your porject here

Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Project	The project is strong, can withstand forces, will have an increased lifespan. Documents will be kept neat and dry. The size is at least 350 x 250 x 60 mm. Was made of recycled paper/ cardboard.	The project is reasonably strong, can withstand forces, will have an increased lifespan. Documents will be kept neat. The size is at least 350 x 250 x 60 mm. Was made of recycled paper/cardboard.	The project is not very strong, can withstand forces to a certain extent, will not have an increased lifespan. Documents will be kept neat. The size is not at least 350 x 250 x 60 mm. Was not made of recycled paper/cardboard.	The project was not done or is incomplete. The measurements does not comply to the specifications. Documents can not be kept neatly in the folder.	**35**

EVALUATION

Evaluation

*Date*_____

Weak vs Strong points

_____

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Possible changes and modifications

_____

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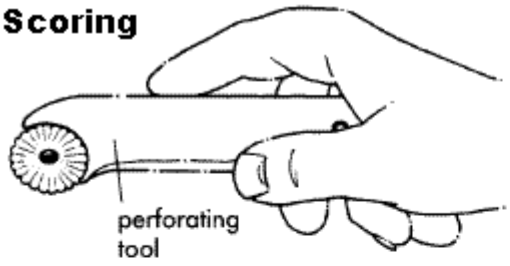
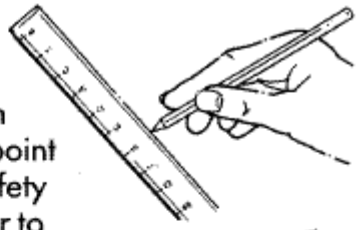
Assessment					
Aspect	**Level 7 (Mastered excellently)**	**Level 6 (Meritoriously mastered)**	**Level 4 (Adequately mastered)**	**Level 2 (Elementary mastered)**	**Mark**
		Level 5 (Substantially mastered)	**Level 3 (Moderately mastered)**	**Level 1 (Not mastered)**	
Evaluation	Relevant evaluation criteria. Useful ideas to improve product.	Reasonable evaluation criteria and ideas to improve product.	Evaluation criteria unclear. Ideas to improve product irrelevant.	No evaluation criteria. Ideas to improve product incomplete.	___ **10**

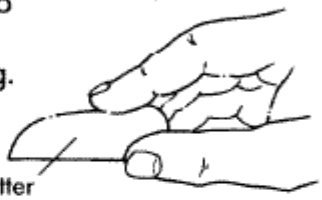
Help with projects

Scoring

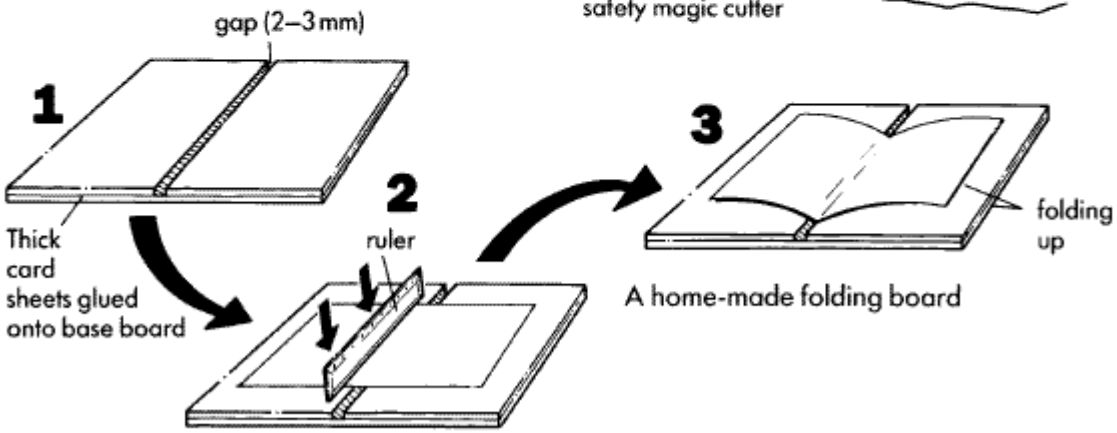


Try using an empty ballpoint pen or a safety magic cutter to score card before folding.





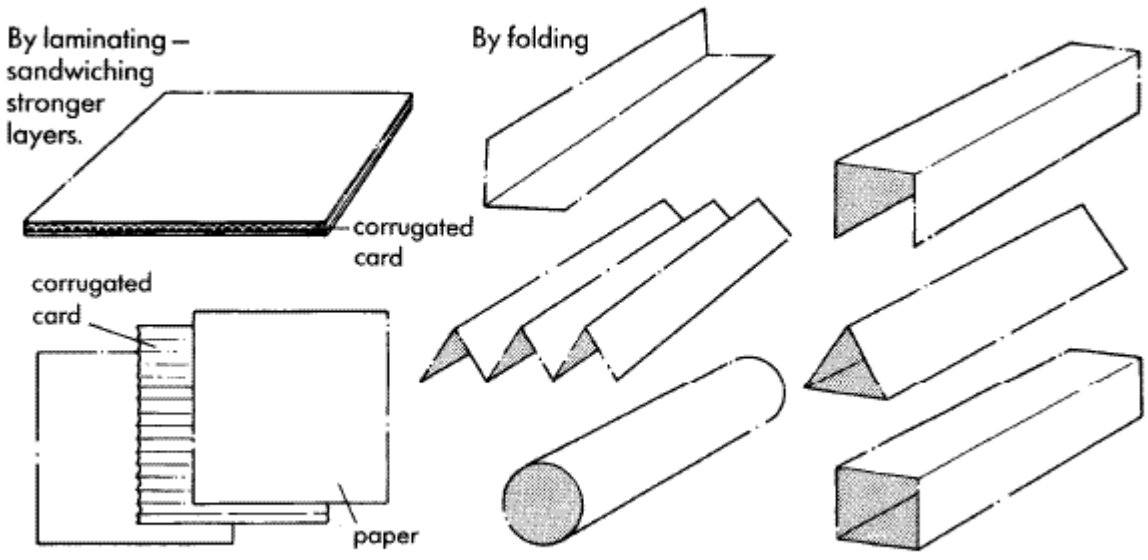
Folding



A home-made folding board

 http://www.sln.org.uk/d&t/Datafile/

Strengthening



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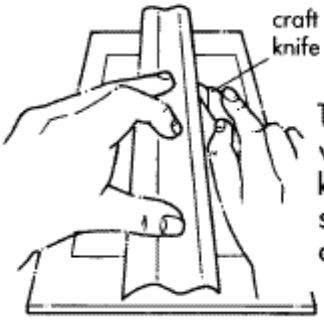
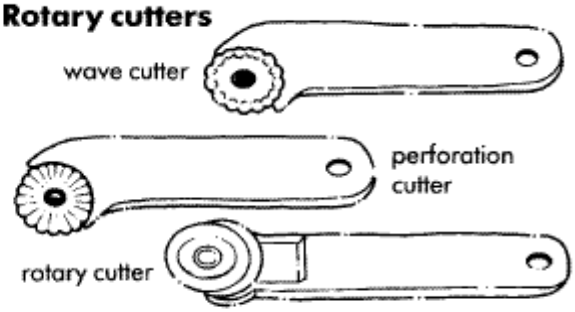
Cutting



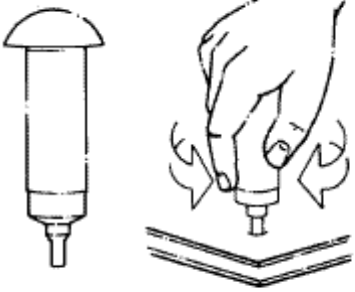
Take extreme care when using a craft knife. Use with a safety rule and cutting board.

Rotary cutters

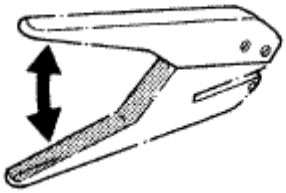


Punching

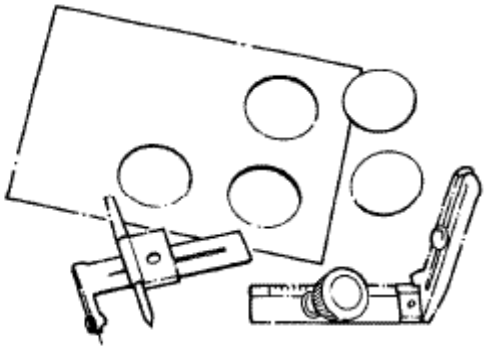
Card drill



Hole punch

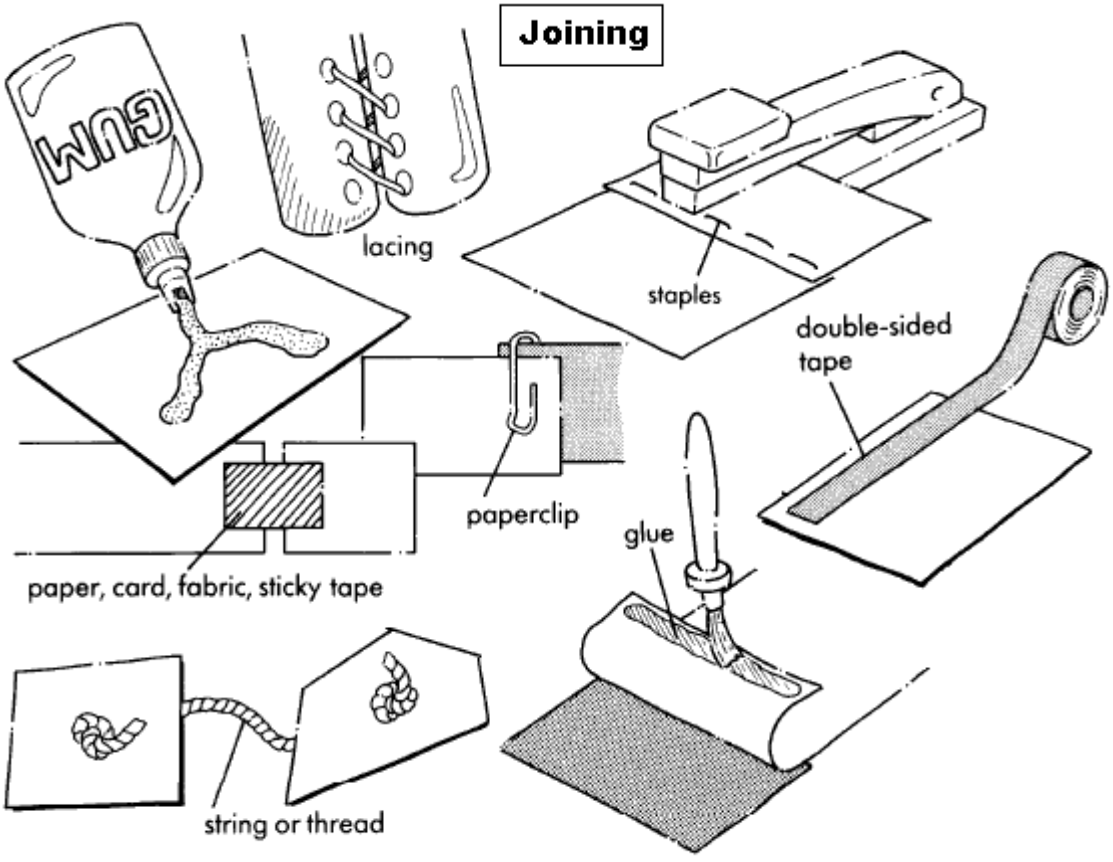


Circle cutters



 http://www.sln.org.uk/d&t/Datafile/

Joining



 http://www.sln.org.uk/d&t/Datafile/