Design & Technology

Jeff Craigen

FOR USE WITH THE I.B. PROGRAMME

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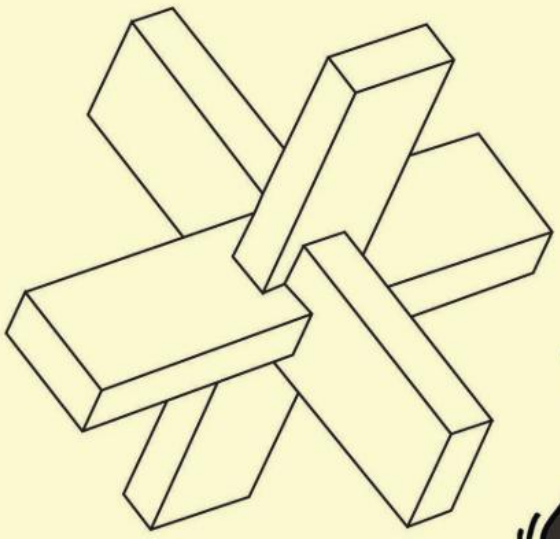

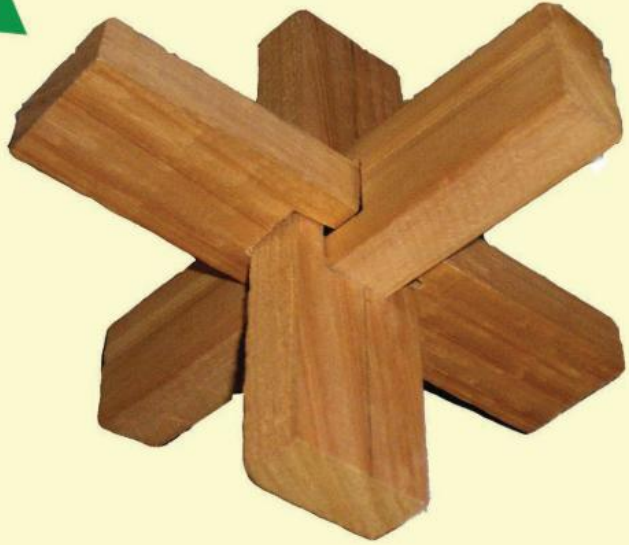

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THE PROJECTS

CONTENTS

The Projects

The Design Cycle 91

Chinese Puzzle

Project for Early Secondary

An ideal starting project, with no variation. Enjoyable for pupils, very easy on the department budget. Ideal filler project.

Points of interest

- Easy and enjoyable to make.
- Students can play with the finished job.
- Cross curricular with maths and graphics.
- Assessment on accuracy and finish.
- No variation for whole class.

Chinese Puzzle project, basic skills.

- Introduction to the workshop.
- Workshop safety.
- Hand tool safety.
- Material selection.
- Wood as a medium.
- Importance of accuracy.
- Finishing a project.

A quick, effective project aimed at the first few years of secondary technology, this project has the flexibility to offer differentiation throughout the year groups.

All three components should be prepared prior to the lesson so that students find it easy to engage with minimal supervision.

It is a great starting or filler project, as weaker students find it possible to keep up with the pace, whilst all students develop good workshop practice.

The stages of manufacture have been compiled to aid the advancement of the class as a unit, rather than the individual.

Teaching points

Some students will try to freehand the measurements.

Accuracy is vital to a successful project.

Occasionally, pupils try to chisel out the slots. This will split the wood.

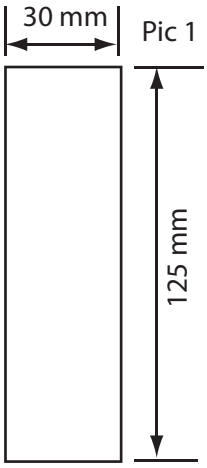
Do not force tight fitting joints. Again, it will split the wood.

Over-cleaning with sandpaper will cause a loose fiting job.

Split work can be glued and used if left to dry

STARTING WITH THE CUTTING LIST:

3 off 125mm × 30mm × 13mm (Pine)



Pic 1

Three pre-cut strips per student.

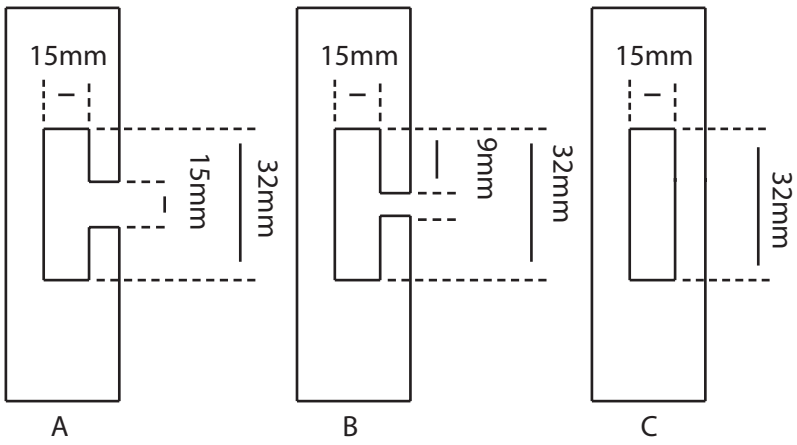
The puzzle works best if the strips are clean and have no knots. Knots are difficult to cut and some will fall out, causing irregular shapes.

It is important that the strips are 13 mm thick for the puzzle to work.

When cleaning, sand with the grain, not across the grain.

CONSUMABLE MATERIALS: NONE

■ STEP 1 MARKING OUT THE STRIPS.



Accuracy at this stage is vital to the end product.

Hardwood with a tight grain is ideal for this project.

Pine with no knots is also suitable, although more prone to split.

■ STEP 2 PUTTING THE PUZZLE TOGETHER

Once the three pieces have been marked out, they can be cut. If the lesson incorporates hand tools, a coping saw should be used. It can also be cut using a vibro saw or, for speed, it is possible to cut on a band saw.

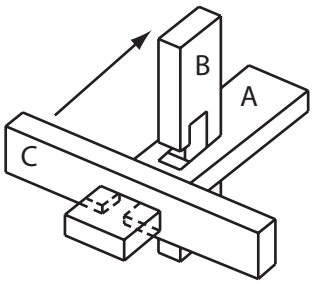
The three parts of the puzzle

IMPORTANT

Cut inside the lines and clean excess out with a file. If the holes are made too big, the puzzle will be too loose and will fall apart.

Do not force any pieces together.

If the strips are over-sanded, this will also result in a loose finish.



HOW TO DO THE PUZZLE

Insert piece B half way into slot in piece C.

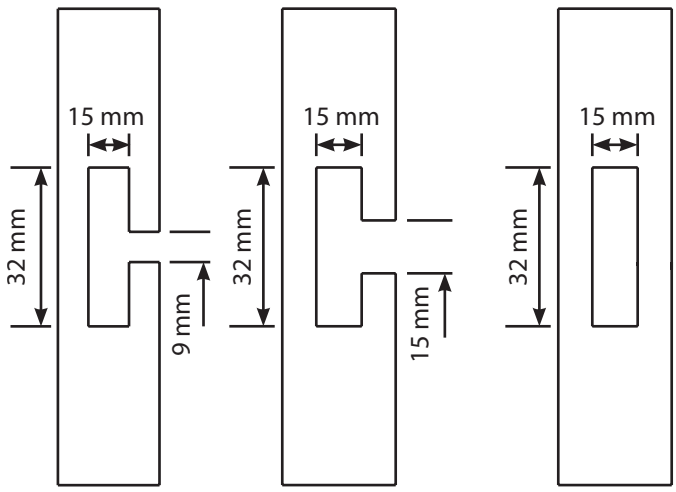
Slide A down C and lock into B.

Clip C into place

WORKSHEET 1 NAME:_____

Before marking out your cuts on wood, mark on the 3 templates below. The three templates shown here are the same size as the actual job. Use these to practise.

Although the information (dimensions) is limited, there is enough to be able to reproduce all the pieces (hint, find the centre lines).



Accuracy is a very important skill to master in Technology. Use a ruler, pencil and a rubber. Getting it right now will save lots of time and problems later.

Teacher comment:

GRADE:_____

WORKSHEET 2 NAME:_____

COMPLETE THE DRAWING BELOW.

Why? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished.

Use a ruler and take your time. Think before drawing.

1. Name the type of wood used in the pieces of the project. _____
2. Choose wood without _____
3. The grain of the wood should run across the width of the pieces. True/False
4. What is the name of the saw used to cut out the pieces _____
5. If the slots are too big, the job will be _____
6. If the slots are too tight, the parts will _____
7. Split pieces can be glued, although they must be allowed to set for _____ hours.
8. Holes should be drilled then _____ and _____ to size.

9. What should be avoided when cleaning the pieces? _____

_____

10. This project is a test of _____

EVALUATION

(This is ann important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could be done better?

_____

_____

_____

_____

_____

_____

_____

_____

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 3 NAME:_____

CALCULATIONS WITH REFERENCE TO THE PUZZLE

1. Half of 125 =_____ (Length of piece)
2. Half of 30 =_____ (Width of piece)
3. Half of 32 =_____ (Length of slot)
4. Half of 15 =_____ (Width of slot)
5. Half of 9 =_____ (Width of opening in piece A, B or C)

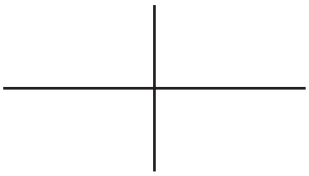
6. Bisect these lines:

7. Mark a section of 32 mm centred on the mid-point of this line:

8. Mark a section off, 15 mm centred on the mid-point of this line:

9. Draw a rectangle 32mm × 15mm:

10. Draw a rectangle 32mm × 15mm, with the cross set in the middle:



11.. What is the surface area of the face of part C? (Clue, Length × Width = _____)

Part C: Length × Width = _____ × _____ . So the area = _____ (X)

What is the surface area of the cut out section?

Part C: Length × Width = _____ × _____ . So the area = _____ (Y)

Surface area of part C = X – Y = _____

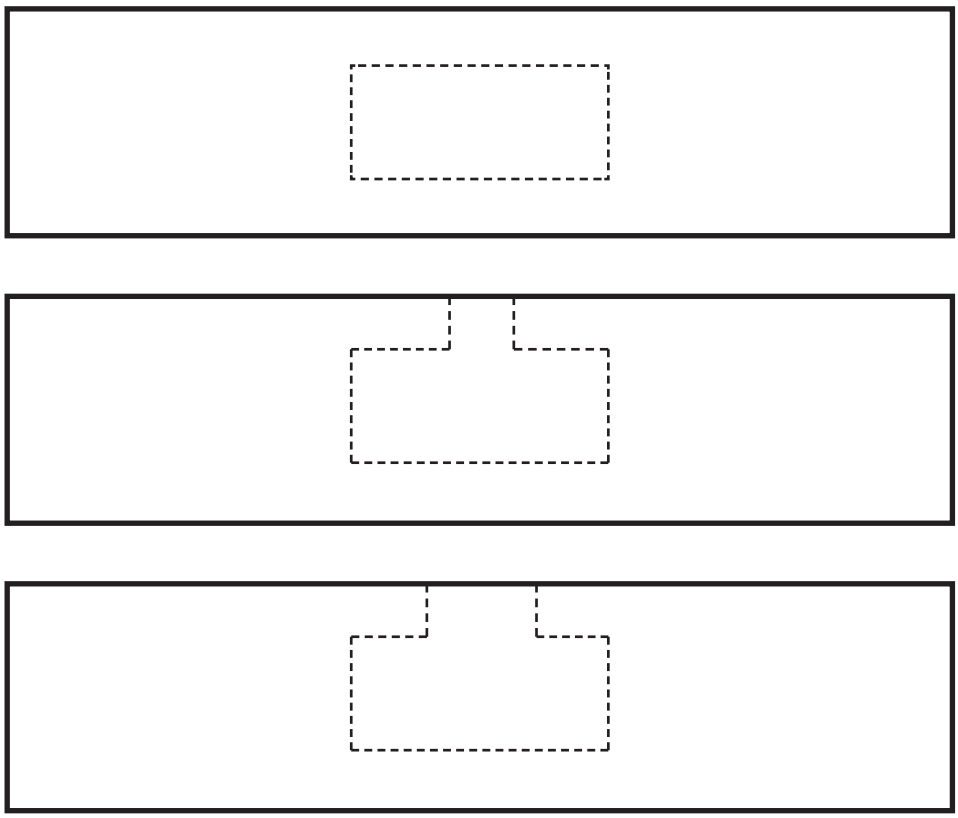
Therefore the Volume is C × thickness (13mm)

Volume = _____ (Volume is written in mm^3).

GRADE:_____

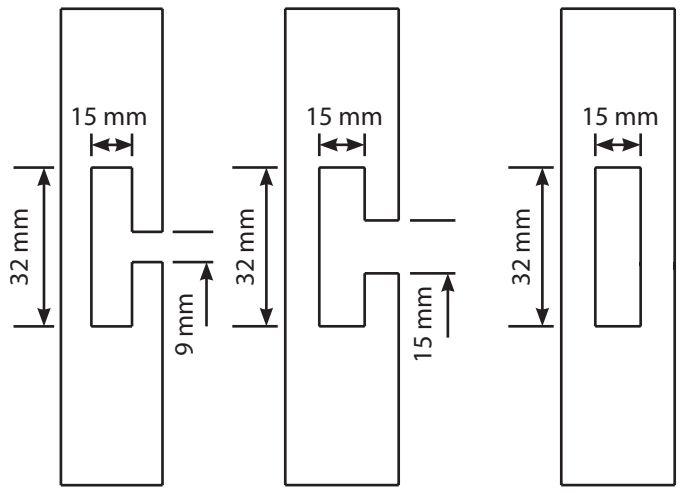
WORKSHEET 1 ANSWERS

Before marking out your cuts on wood, mark on the 3 templates below. The three templates shown here are the same size as the actual job. Use these to practise.



Although the information (dimensions) is limited, there is enough to be able to reproduce all the pieces (hint, find the centre lines).

Accuracy is a very important skill to master in Technology. Use a ruler, pencil and a rubber. Getting it right now will save lots of time and problems later.



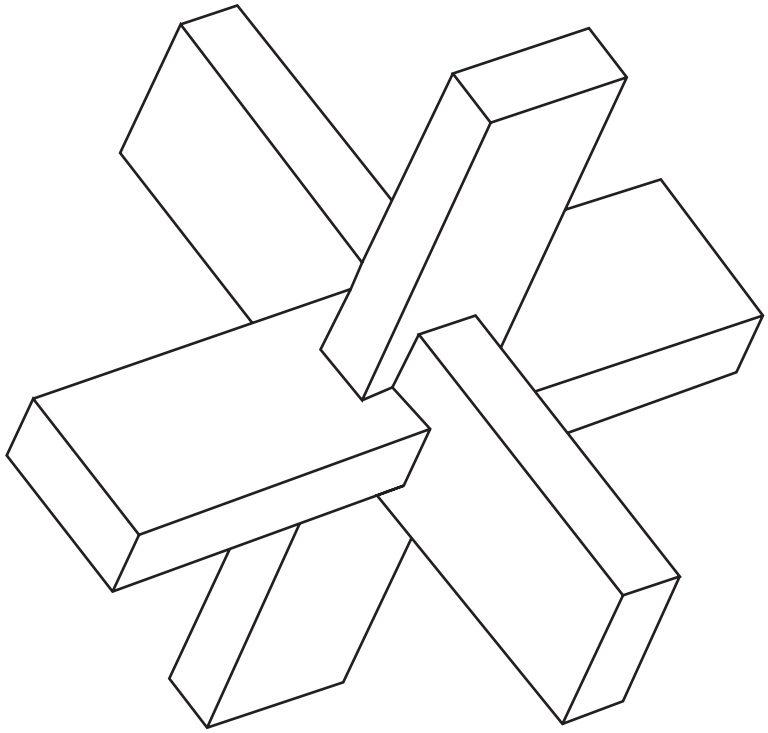
Accuracy is a very important skill to master in Technology. Use a ruler, pencil and a rubber. Getting it right now will save lots of time and problems later.

Teacher comment:

WORKSHEET 2 ANSWERS

COMPLETE THE DRAWING BELOW.

Why? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished.



1. Name the type of wood used in the pieces of the project. **Pine**

2. Choose wood without **Knots**

3. The grain of the wood should run across the width of the pieces. **False**

4. What is the name of the saw used to cut out the pieces **Coping Saw**

5. If the slots are too big, the job will be **Loose**

6. If the slots are too tight, the parts will **Split**

7. Split pieces can be glued, although they must be allowed to set for **24** hours.

8. Holes should be drilled then **drilled** and then **filed** to size.

9. What should be avoided when cleaning the pieces? **If it is over cleaned or too much material is removed, the project will be too slack or loose.**

10. This project is a test of **Accuracy**.

EVALUATION

(This is an important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could be done better?

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

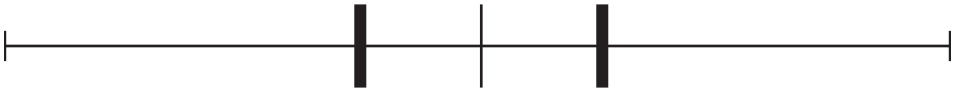
WORKSHEET 3 ANSWERS

CALCULATIONS WITH REFERENCE TO THE PUZZLE

1. Half of 125 = **62.5** (Length of piece)
2. Half of 30 = **15** (Width of piece)
3. Half of 32 = **16** (Length of slot)
4. Half of 15 = **7.5** (Width of slot)
5. Half of 9 = **4.5** (Width of opening in piece A, B or C)

6. Bisect these lines:

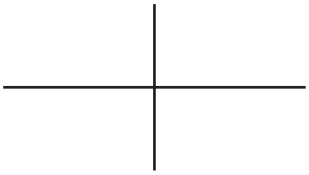
7. Mark a section of 32 mm centred on the mid-point of this line:



8. Mark a section off, 15 mm centred on the mid-point of this line:

9. Draw a rectangle 32mm × 15mm:

10. Draw a rectangle 32mm × 15mm, with the cross set in the middle:



11.. What is the surface area of the face of part C? (Clue, Length × Width = _____)

Part C: Length × Width = **125 mm** × **30 mm** . So the area = **3750 mm²**

What is the surface area of the cut out section?

Part C: Length × Width = 32 mm × 15 mm . So the area = **480 mm²**

Surface area of part C = X – Y = **3750 – 480 = 3270 mm²**

Therefore the Volume is C × thickness (13mm)

Volume = **3270 × 13 = 42510 mm³** (Volume is written in mm³).

GRADE:_____

Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem, design brief client and brainstorm	Project introduction, discussion on puzzle design, construction and problems.	Storyboard, A4 paper. Pre made game. Example material.	English, Maths, IT (research), Graphics. Teacher observation.	Collection of images of games. A4 sheet. Complete classwork.
2	Research and selection of construction, material. Look at existing products.	Isometric demo, visual blow up of cuts and why. Investigate products.	A4 paper, Examples of joins. Alternative puzzle ideas. Fabrication points.	English, Maths, IT (research), Graphics and teacher observation.	Compile preferred images. Complete class work. Rough sketch of parts.
3	Marking out wood, using correct measurements and cutting material.	Teacher demonstration of each section. Individual practical session. Use of hand tools.	Pine (type) wood (no knots), pre cut. PVA, pencils, rules, etc.	Maths. Graphical ability. Quality and accuracy. Teacher observation.	Produce a material and equipment list used for lesson tasks.
4	Finish cutting the three parts. Clean burs and marks from job.	Practical lesson to finish cutting of blocks. Cleaning using sandpaper.	Pine (type) wood (no knots), pre cut. PVA, pencils, rules, etc.	Maths. Graphical ability. Quality and accuracy. Teacher observation.	Student self evaluate the project, list of personal improvements.
5	Learn importance of accuracy through marking out and checking.	Finish practical work, clean and stain. Play with project. Evaluate finished job.	Project boards, PVA, sandpaper, pencils, rules, A3 paper.	Maths. Graphical ability. Quality and accuracy. Finished job.	Students self evaluate the project and compile a list of improvements.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
B Design	The student does not reach any of the standards described by the descriptors to the right.	The Student has completed some of the four design brief worksheets. S/he has shown a basic understanding of the project in drawing form.	The Student has completed the four design brief worksheets. S/he has shown a fair understanding of the project. S/he has constructed a fair representation, in isometric form, of the project.	The Student has completed the four design brief worksheets to a high standard. S/he has shown a good understanding of the project. S/he has produced a high standard isometric drawing of the project.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student has limited understanding of task management. S/he has not been able to complete the project.	The student has an understanding of task management. They have been able to complete the project on time.	The student has planned out the use of time over available equipment. S/he understood and managed the tasks effectively.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product. S/he worked safely.	The student created the product according to the approved design and following the plans. They worked safely and tidily throught the unit.	The student created the product according to the approved design and following the plans. Their work is accurate and well finished. S/he has worked safely and tidily throughout the unit.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student provides a very basic rating of his/her performance.	The student provides a basic rating of his/her performance. Reflects possible improvements in future work.	The student provides an overall rating of his/her performance. Justifies the rating and reflects possible improvements in future work.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provided a little evidence of personal engagement with the subject.	The student provided evidence of personal engagement with the subject (a generally positive attitude) in technology.	The student provided evidence of personal engagement with the subject (independence, general positive attitude) in technology.

TIME FRAME AND DURATION:

- 6 to 8 Weeks at 2 × 45 min per week.

AREA OF INTERACTION

- Approaches to Learning, Human Ingenuity

INTERDISCIPLINARY AND CURRICULUM LINKS

- Maths

SIGNIFICANT CONCEPTS

- Outline the design brief.
- Design a test to evaluate the product against the design specification.
- Evaluate the designs against the design specification.
- Use a range of appropriate techniques and equipment competently.
- Suggest ways in which performance could be improved.
- Carry out units of work in technology using materials and techniques safely and responsibly.

MYP UNIT QUESTION

- Why is it important to be able to accurately mark out a piece of work in technology?

SUB QUESTIONS

- Why should we know the project before making the object?
- Why is accuracy important?

ASSESSMENT:

Students will:

- Complete the four worksheets provided for this project.
- Accurately mark out work using previously completed worksheets.
- Follow the stages correctly for fabrication of project, using appropriate tools and machinery.
- Produce a dimensioned isometric drawing of the finished project.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED

- Design, Plan, Create, and Evaluate. Attitudes to Technology.

ASSESSMENT CRITERIA TO BE USED:

- B, C, D and E, F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED

- Mathematic skills, for the marking out and preparation prior to fabrication.
- English skills for understanding the task to be performed.
- Art experience for the ability to draw and create working diagrams/drawings.

APPROACHES TO LEARNING

- The unit is aimed at developing in the students a limited understanding of the processes involved in design technology. Students will become familiar (by use) with tools and equipment as well as the safety aspects involved.

LEARNING EXPERIENCES

- Students will initially work from the pre developed worksheets to gain an understanding of the unit. They will see finished work prior to starting to show direction. They will receive safety instructions for using the various equipment required to complete the project.
- Students will acquire knowledge by completing the various tasks. Several tasks will be opened to them. All must be completed (student centred learning will take place).
- It is expected (or presumed) that students have a little prior knowledge of the subject.

TEACHING STRATEGIES

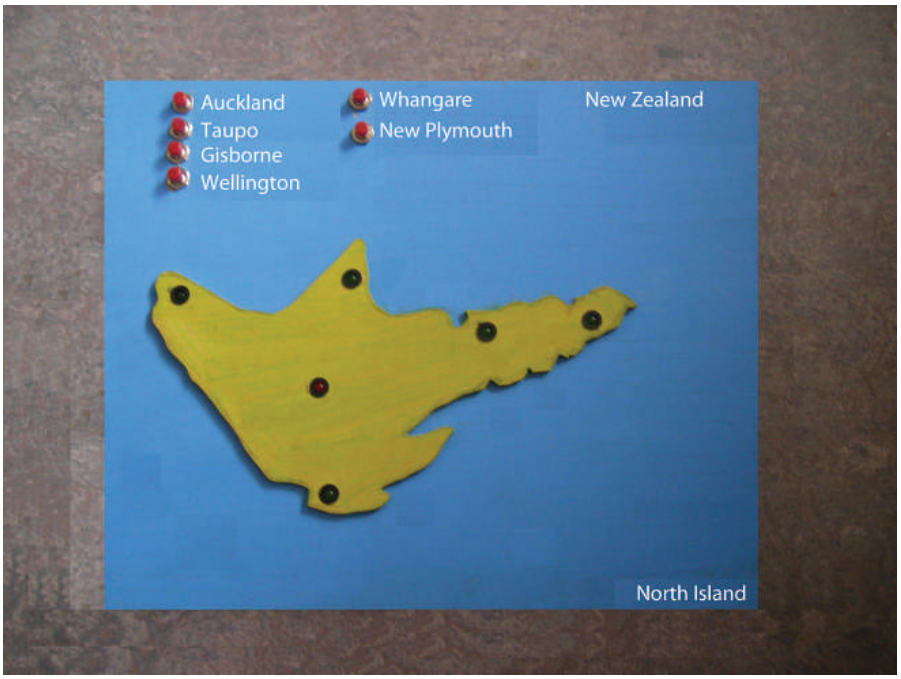
- Assessment will be based initially on the worksheets i.e. completion and presentation. Student understanding (and therefore assessment) will become obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and verbal teacher input during practical work should also occur.
- The project is aimed at student centred learning. The student should be aware of what is required and should manage the tasks to suit availability of equipment and stages needed.
- The project has huge scope for differentiation either in the starting point or the stages (can be adjusted) as required by the teacher.
- This is a highly visual project and students with language difficulties and, to some extent, learning difficulties can follow the step by step pictorial guide in the notes.

RESOURCES

- The project will be based solely in the Design & Technology room to allow students to become familiar with the workshop. However, teachers should make frequent reference to external manufacturing and material availability.

ELECTRONIC MAP- Junior Electronics

An introductory project exploring basic principals and wiring practices. enjoyable to pupils, easy on the department budget.



Points of interest

- Easy and enjoyable to make.
- Students can play with finished job.
- Cross curricular with Humanities and Graphics.
- Assessment on accuracy and finish.
- Limited variation for whole class.

Electronics Map project basic skills.

- Introduction to switches.
- Workshop safety.
- Introduction to wiring.
- Material selection.
- Soldering.
- Circuits.
- Finishing a project.

When using electricity it is important to reinforce the dangers associated at the beginning of every lesson.

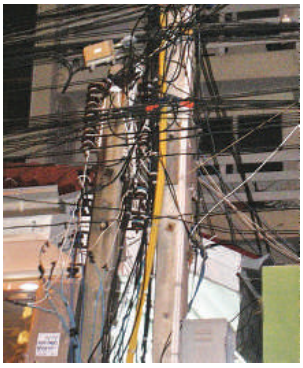
This project introduces students to the planning and wiring of a basic systems panel.

The circuit shows how a single feed (9V positive /negative) can split into multiple functions.

It also highlights the need for the circuit to be complete for it to function.

Other expansions are the push to make switches and a single resister for protection.

It can be added to but students need to be aware of over connecting and the resulting confusion - as can be seen below.



Over-connecting!

Points to look out for

Copper tape joints must be soldered or no circuit will be made.

Tinning all wires is good practice and will help students during the practical phase.

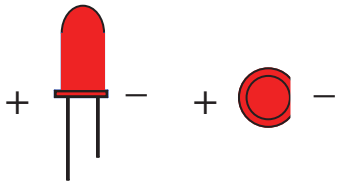
Allow the glue to dry on boards before drilling.

Clean excess glue before painting.Some students find it easier to paint the boards separately prior to glueing. Avoid drilling on the edges.

STARTING WITH THE MATERIALS LIST

2 off Sheet of MDF 8mm or 10mm (Depending on map size) one for base one fore map.

5 off 5mm LEDs Red LEDs work well (LED = light emitting Diode)

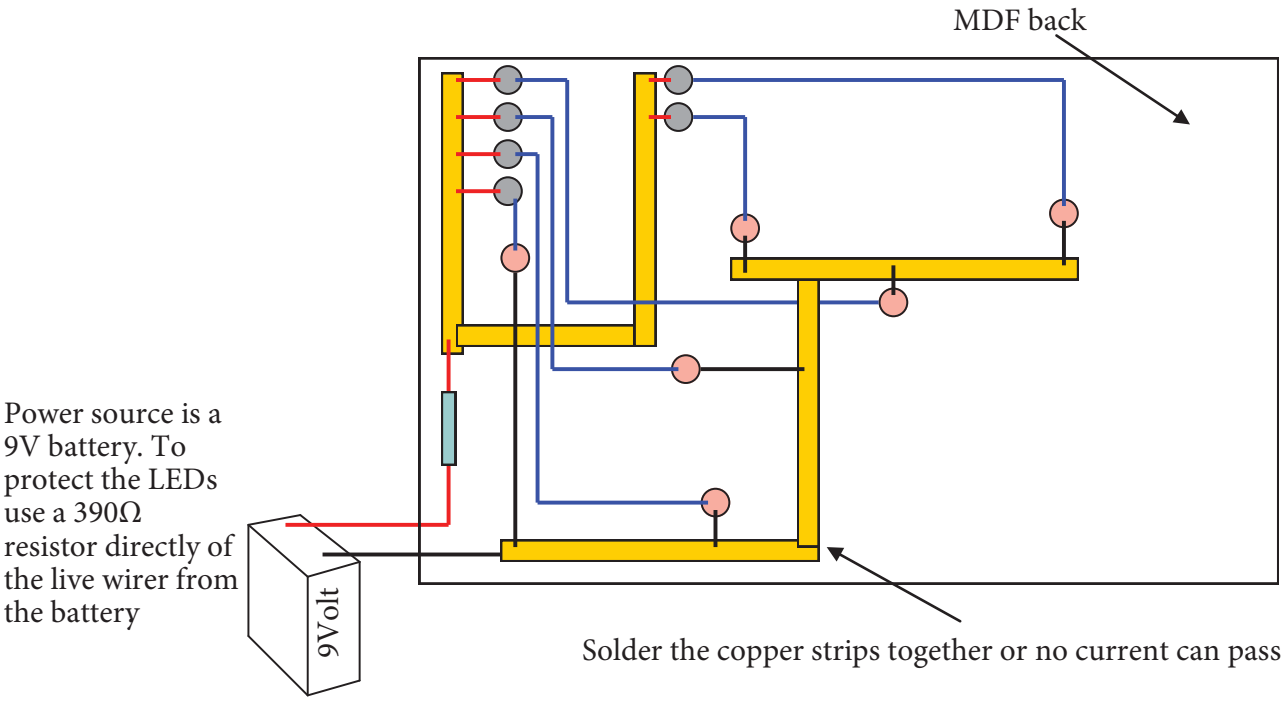


5 off Push to make switches, 5mm all should have a return spring

Red Wire Blue Wire Black Wire

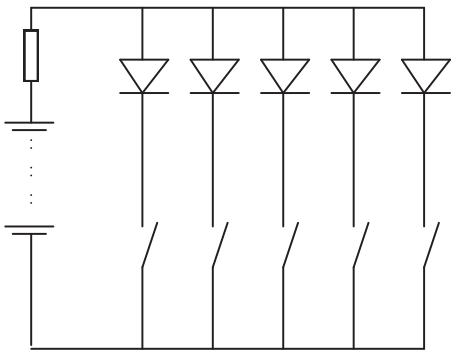
Self adhesive copper tape Battery Snap 390 ohm resister

PVA, Paint.



Street wiring in Asia

WITH SOME CAREFUL PLANNING, THE SITUATION SHOWN IN THE PICTURE (LEFT) CAN AND SHOULD BE AVOIDED!



Above is the circuit diagram for the map.

STEP 1

Allow the students time to decide and research the country of their choice. At this time, it is also a good idea to have them write down five cities within their chosen country.

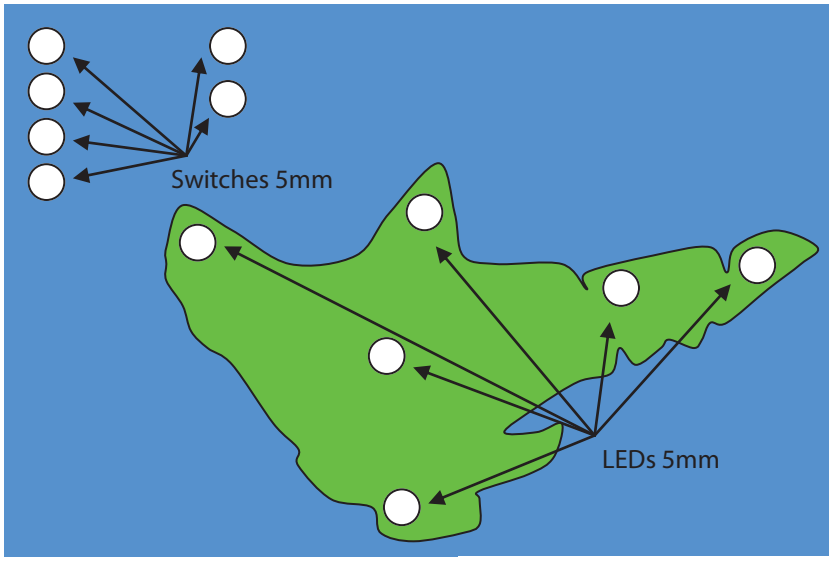
Transfer (enlarge or shrink if necessary) the map onto one for the MDF boards and cut out using a coping or vibro saw. Sand around the edges for a better finish.

Paint the base. Paint the country and glue together. Leave to dry.

STEP 2

Keep the switches all in line for a better appearance. Double check that the cities are in the correct place before drilling.

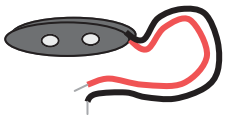
Touching up with paint at this stage is better and easier than later.



TIP

TRY NOT TO DRILL ON THE EDGES OR THE LEDS WILL NOT FIT PROPERLY.

DRILL FROM THE FRONT OF THE MAP THROUGH TO THE BACK.

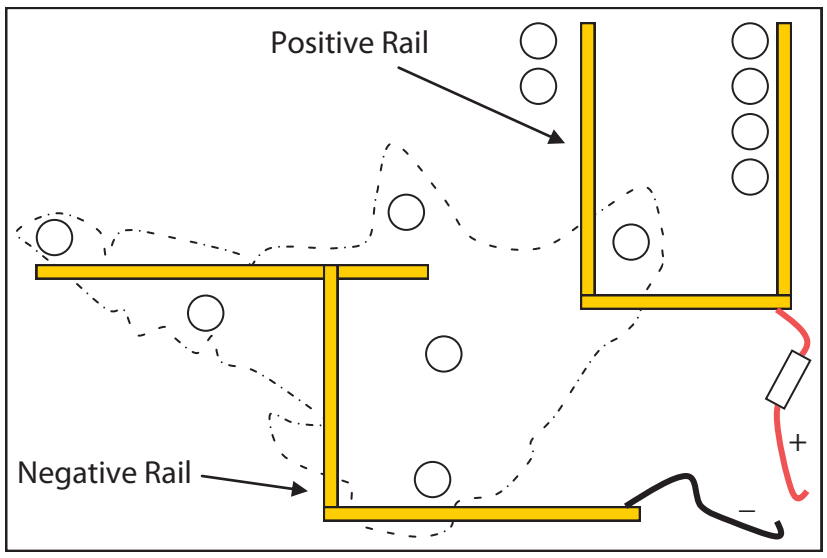


STEP 3

After much paper planning, the project should now be ready for the circuit.

After peeling the back of the self adhesive copper tape, lay the tracks for the positive rail and the negative rail.

After tinning, solder the battery snap and the resistor in place.



The map to the right is of South East Asia and in particular Thailand. All the principals are the same, one positive and one negative track and all switches are individual circuits.

Despite having two rows of switches, it is not necessary to use two circuits.

Avoid fixing a permanent back on the project as maintenance may, sometimes, be needed.

STEP 4

Begin the wiring. Remember only completed circuits will work.

Positive = Red

Intermediate = Blue

Negative = Black

Switches may be wired either way however the LED will only work one way.

Fitting the resistor is vital to protect the LEDs.

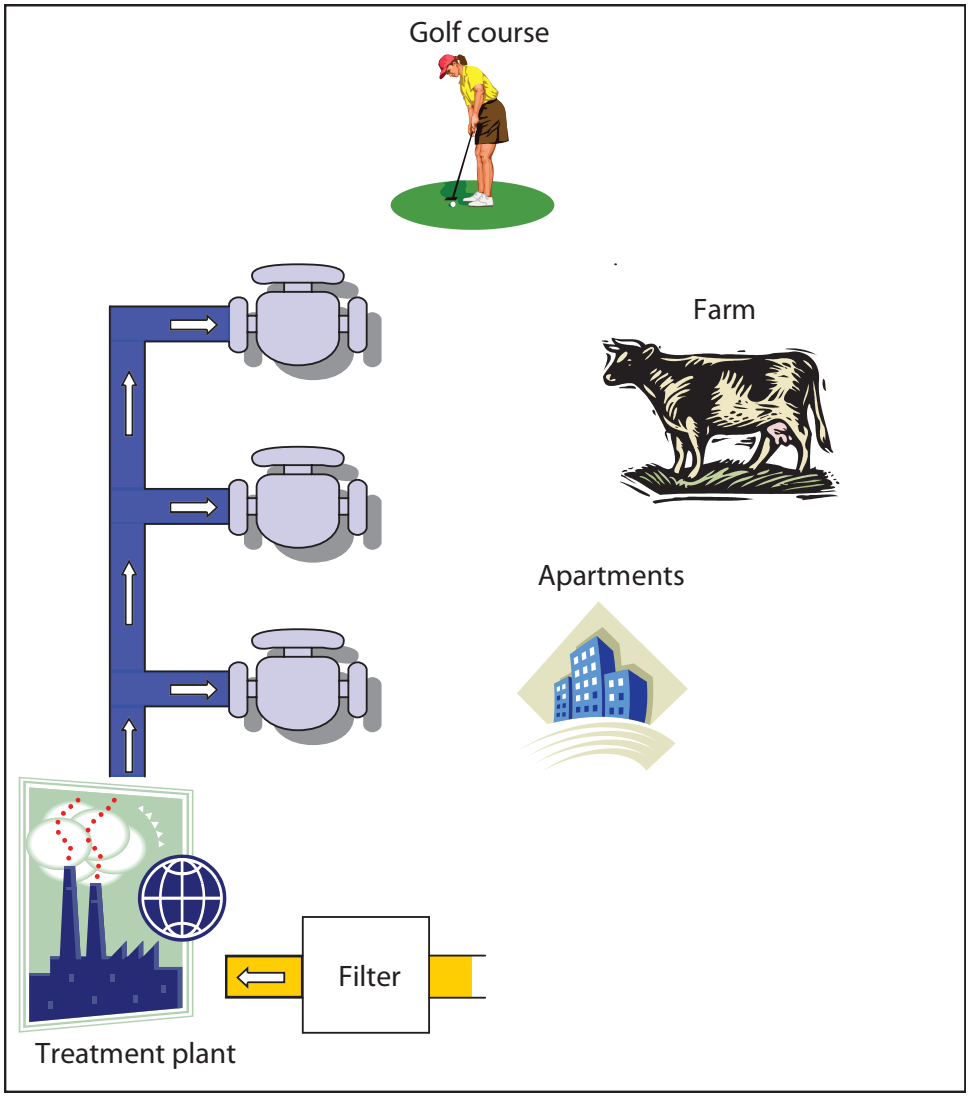
Although the principals of the circuit are simple, making the project work will take accuracy and good soldered joints.

Tracing problems and fixing them can prove very frustrating.

WORKSHEET 1 NAME:_____

KNOWING THE PROJECT

This task will help you to keep your wiring design simple. You must pipe clean water to the Golf Course, the Farm and the Apartments. You must also pipe the dirty water back to the Water-treatment plant through the Filter. No pipes can cross each other. Complete the piping in the drawing below.



Water in this drawing only flows one way. We will call this 'direct flow'. However, if the water was to flow both ways, we would call this 'alternating flow'.

When we think about electricity in the same way, we don't say 'flow', we say 'current'.

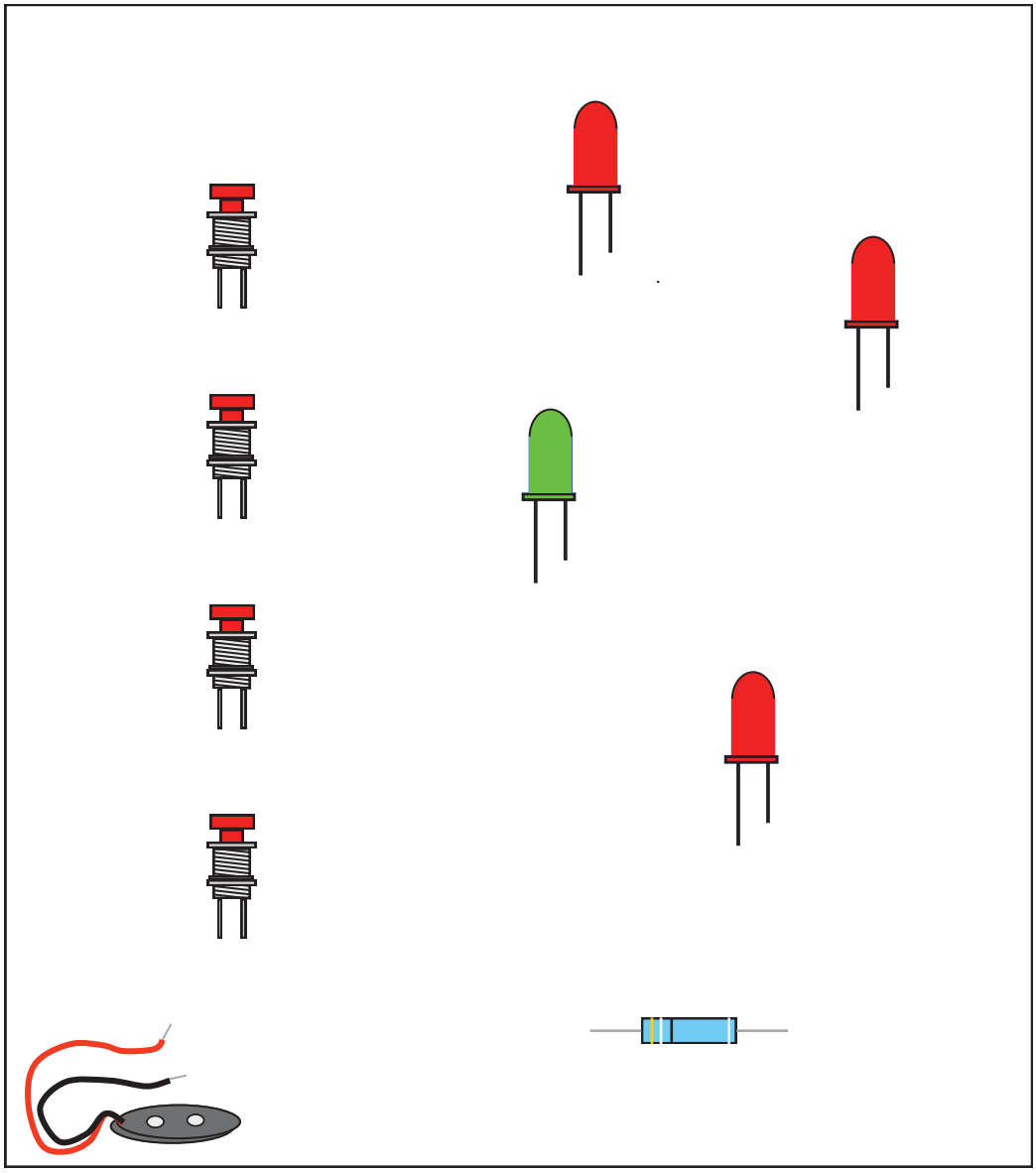
So, electricity that only flows one way is called _____ current. (DC)

And electricity that flows both ways is called _____ current (AC)

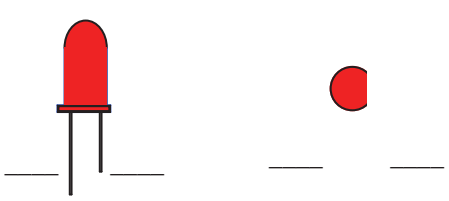
Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 2 NAME:_____

Wire the following components so that each button switch operates one of the LEDs. Try to keep the wiring as tidy as possible.



Mark on the LEDs the positive terminal (+)

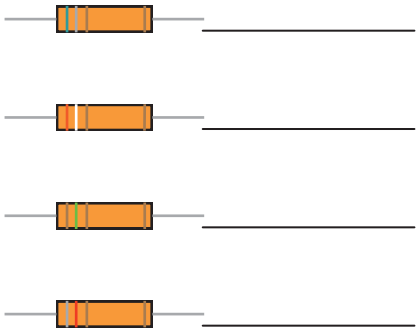


...and the negative terminal (ó)

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

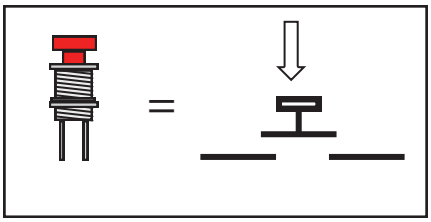
WORKSHEET 3

NAME:_____



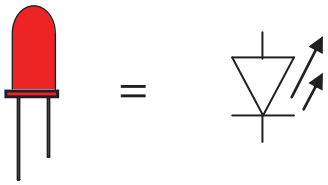
Colors	First Band	Second Band	Third Band
Black	0	0	-
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Violet	7	7	0000000
Gray	8	8	00000000
White	9	9	000000000

Below is a 'push to make' switch.



This is a switch and the Symbol for the switch.

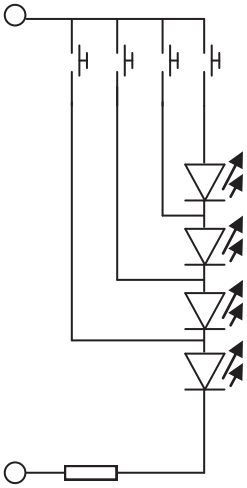
Below is a LED, LED means: Light emitting diode.



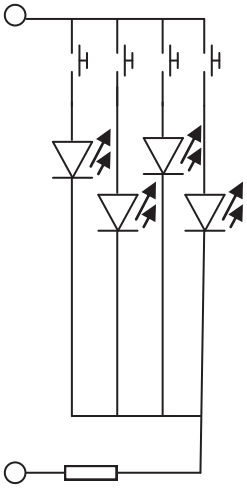
This is a LED and the Symbol for a LED.

By using the symbols, not the pictures, choose the diagram below that is correct and which will work.

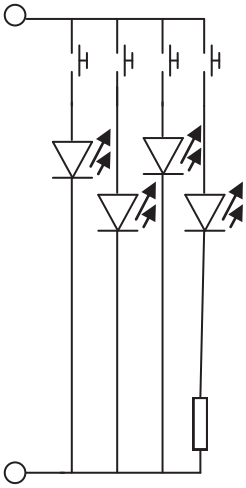
A



B



C



Briefly explain your choice:_____

_____

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 4

NAME:_____

1. Draw and describe a LED in the box (A)
2. Draw and describe a battery in box (B)
3. Draw and describe a resistor in box (C).

A

B

C

Evaluation (This is an important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could be better?

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

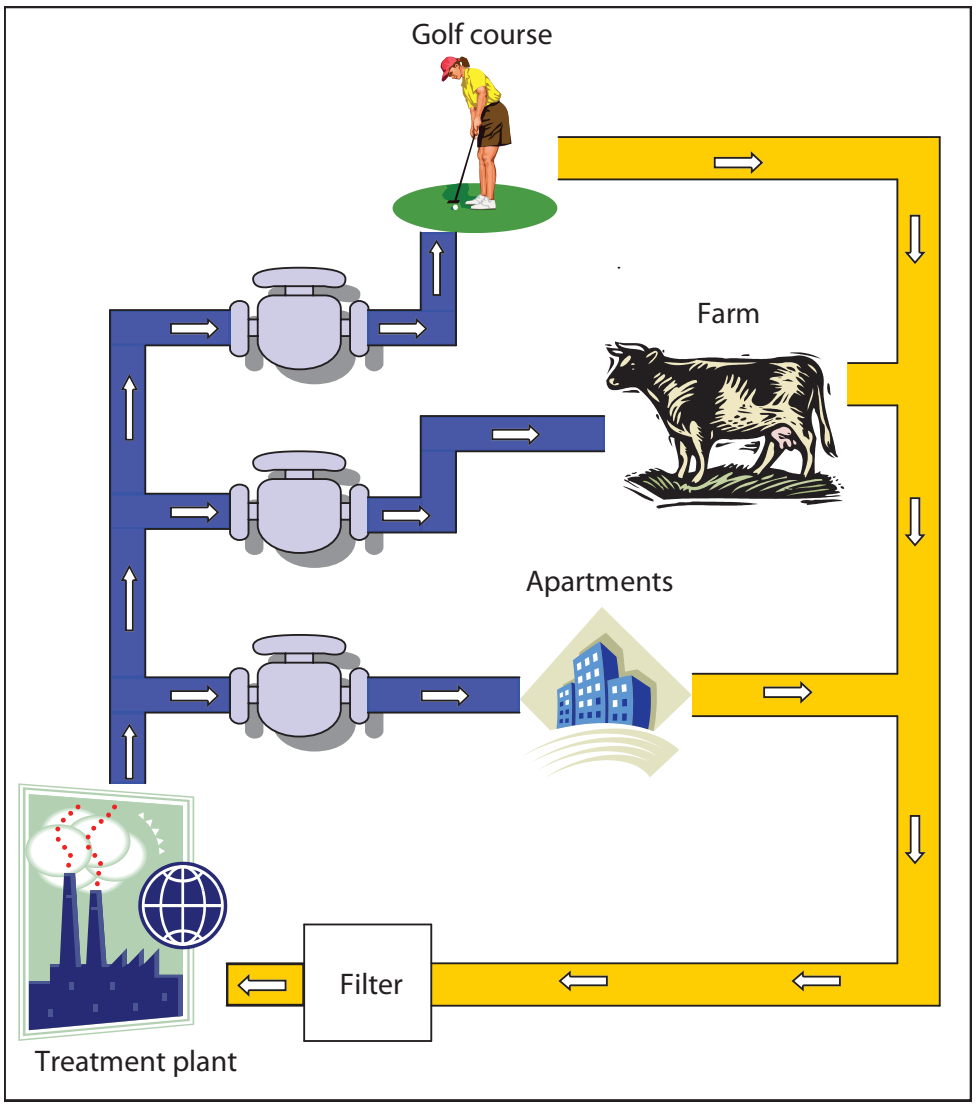
WORKSHEET 1 ANSWERS

KNOWING THE PROJECT

This task will help you to keep your wiring design simple.

You must pipe clean water to the Golf Course, the Farm and the Apartments. You must also pipe the dirty water back to the Water-treatment plant through the Filter. No pipes can cross each other.

Complete the piping in the drawing below.



Water in this drawing only flows one way. We will call this 'direct flow'. However, if the water was to flow both ways, we would call this 'alternating flow'.

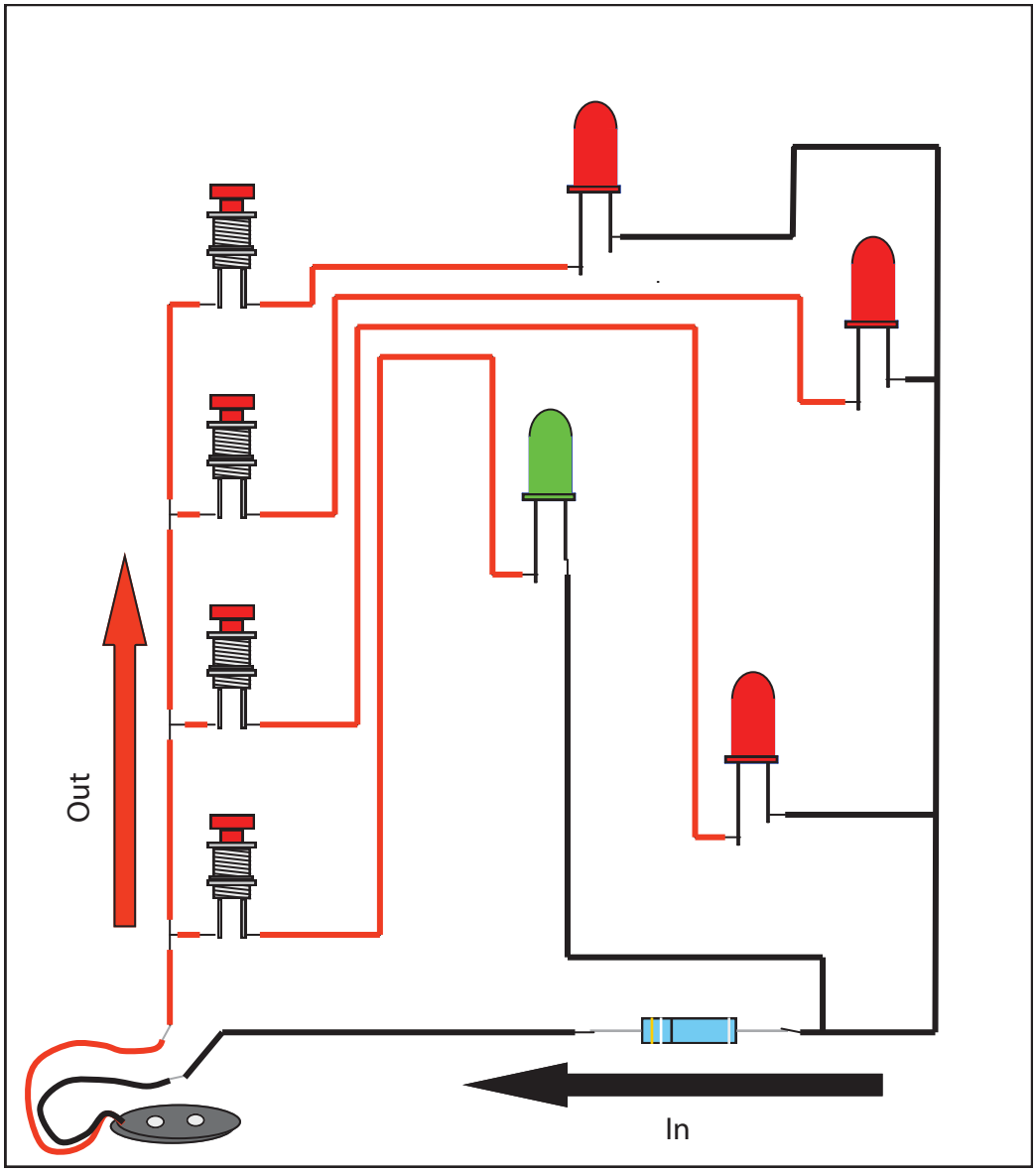
When we think about electricity in the same way, we don't say 'flow', we say 'current'.

So, electricity that only flows one way is called **direct** current. (DC)

And electricity that flows both ways is called **alternating** current (AC)

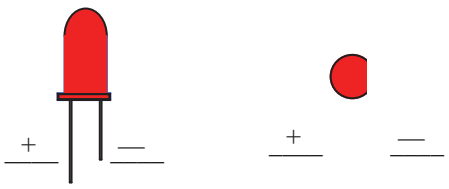
WORKSHEET 2 ANSWERS

Wire the following components so that each button switch operates one of the LEDs. Try to keep the wiring as tidy as possible.

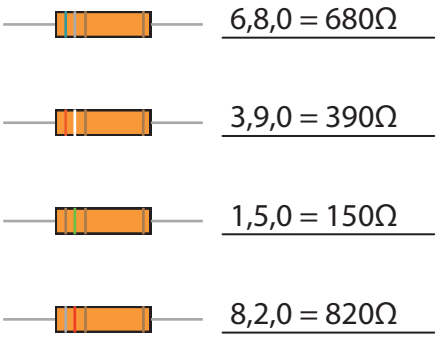


Mark on the LEDs the positive terminal (+)

...and the negative terminal (ó)



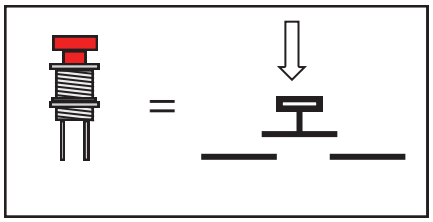
WORKSHEET 3



ANSWERS

Colors	First Band	Second Band	Third Band
Black	0	0	-
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Violet	7	7	0000000
Gray	8	8	00000000
White	9	9	000000000

Below is a 'push to make' switch.



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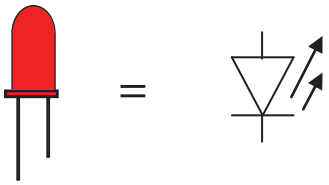
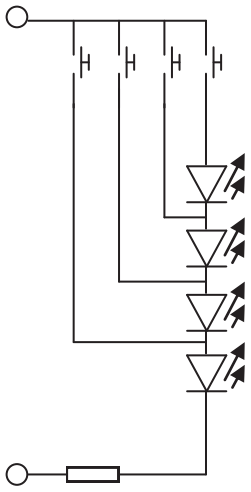
Below is a LED, LED means: Light emitting diode.



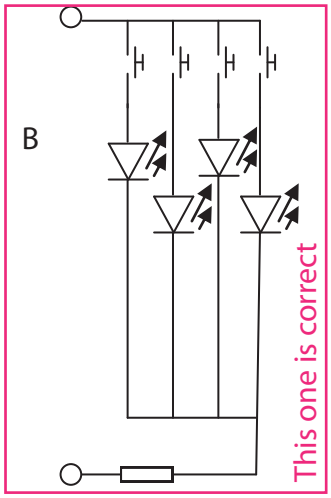
This is a LED and the Symbol for a LED.

By using the symbols, not the pictures, choose the diagram below that is correct and which will work.

A

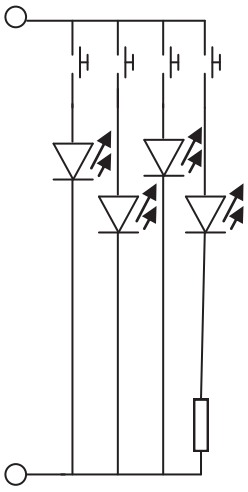


B



This one is correct

C



Briefly explain your choice:_____

_____

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 4

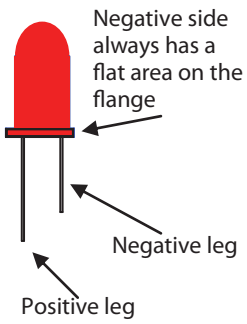
ANSWERS

1. Draw and describe a LED in the box (A)
2. Draw and describe a battery in box (B)
3. Draw and describe a resistor in box (C).

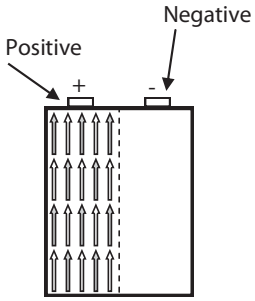
C

A resistor restricts the flow of electricity.

A



B



Evaluation (This is an important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could be better?

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

Scheme of work

The Scheme of work may look something like this: This scheme of work is only a guide.

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem design brief, client and brainstorm	Project introduction, discussion on map construction and problems.	Storyboard, A4 paper. Pre-made joints. Exemplar material.	English, Maths, IT (research), Graphics, Humanities. Teacher observation.	Collection of map images. Scaled to fit and cut out. Cities marked.
2	Research of construction, material selection. Close look at wiring.	Isometric demo, visual blow up of possible wiring solutions. Investigate switches and LEDs.	A4 paper, Examples of planning, Alternative ideas. Fabrication points.	English, Maths, IT (research), Graphics, Humanities. Teacher observation.	Compile preferred strategies, Rough sketch plan and parts.
3	Marking out wood, cut to shape, paint and glue boards together.	Teacher demonsstration of each section. Individual practical session. Use of hand and machine tools.	MDF (type) wood (6mm), pre cut boards. PVA, pencils, rules, etc.	Maths, Graphical ability, Quality and accuracy. Humanities. Observation	Produce a material and equipment list used for lesson tasks.
4	Finish cutting and cleaning and glue. Drill holes for switches and LEDs.	Practical lesson to finish cutting and drilling. Cleaning using sandpaper.	MDF (type) wood (6mm), pre cut boards. PVA, pencils, rules, etc.	Maths, Graphical ability, Quality and accuracy. Teacher observation.	Student to self evaluate the project, make a list of personal improvements.
5	Construction and assembly of box carcass. Square, evaluation.	Practical lesson begin fitting and wiring of the components. Soldering and Tinning.	Project boards, PVA, sandpaper, pencils, rules, A3 paper.	Maths, Graphical ability, Quality and accuracy. Finished job.	Student to self evaluate the project, make a list of personal improvements.
6	Learn importance of accuracy through marking out and planning.	Practical lesson begin fitting and wiring of the components. Soldering and Tinning.	Project boards, PVA, sandpaper, pencils, rules, A3 paper.	Maths, Graphical ability, Quality and accuracy. Finished job.	Student to self evaluate the project, make a list of personal improvements.
7	Learn importance of accuracy through marking out and planning.	Finish practical work, clean and paint. Play with project. Evaluate finished job.	Project boards, PVA, sandpaper, pencils, rules, A3 paper.	Maths, Graphical ability, Quality and accuracy. Humanities. Observation	None, take project home.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student has not developed on the given design brief.	The student has developed on the given design brief. S/he has identified a range of appropriate information.	The student has developed on the given design brief. They have identified and acknowledged a range of appropriate information.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student follows the given plans with little or no adaptation.	The student has understood the project and enhanced the design to suit his/her own ideas.	The student has clearly visualized the given project and adapted the criteria to suit his/her own individual design ideas.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student has followed the given scheme.	The student has generated two acceptable designs that meet the specification.	The student has generated several feasible designs that meet the specification and justifies his/her final choice.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product according to the given design, working safely through the unit.	The student created the product according to his/her individual design. S/he have completed the map to a reasonable standard, working safely through the unit.	The student created the product according to his/her individual design. S/he has completed the table to a high quality, working safely and tidily throughout the unit.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student evaluates his/her use of the design cycle.	The student evaluates his/her use of the design cycle, and suggests how his/her performance could be improved.	The student evaluates his/her use of the design cycle. S/he evaluated his/her performance at each stage and suggested how it could be improved.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provides evidence of personal engagement with the subject.	The student provides evidence of personal engagement with the subject ie - motivation, positive attitude.	The student provides evidence of personal engagement with the subject ie - motivation, positive attitude and independence.

TIME FRAME AND DURATION

- 6 to 8 Weeks at 2 × 45 min lessons per week.

AREA OF INTERACTION:

- Community and Service, Human Ingenuity.

INTERDISCIPLINARY, CURRICULUM LINKS WITH:

- Maths and Geography, PSHE.

SIGNIFICANT CONCEPTS:

- Outline and understand the design brief.
- Justify or logically disagree with the given design.
- Use and apply ICT effectively as a means to access, process and communicate information, and to solve problems.
- Use a range of appropriate techniques and equipment competently.
- Provide evidence of personal engagement with subject.
- Collect, analyse, select, organize and evaluate information.

MYP UNIT QUESTION

- When and how are input/output devices used in everyday life?

Sub questions:

- How can interdisciplinary subjects support each other?
- How important is design technology in today's world?

ASSESSMENT: STUDENTS WILL:

- Complete the worksheets provided specifically for this project.
- Utilize geography for the country, global position and major cities within. Use ICT for the country research and map and flag printing. Use Mathematics for the scaling to size the map. (Possible science connection with the flow of electricity).
- Follow the stages correctly for fabrication of project, using appropriate tools and machinery.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate, Design, Plan, Create, Evaluate, AiT

ASSESSMENT CRITERIA TO BE USED:

- A, B, C, D, E and F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- A reasonable level of understanding in the related subjects.
- Previous experience in workshop practice and use of basic tool skills.
- Art experience for the ability to draw and create working diagrams, drawings.

APPROACHES TO LEARNING:

- The unit is ideal for students to work on a multiple interdisciplinary project. Several subjects must be combined to reach the final outcome. Other skills such as information, literacy, organizational, problem solving and reflection must also be used.

LEARNING EXPERIENCES:

- The students will initially work from the pre developed worksheets to gain an understanding of the unit. They will see finished work prior to starting to show direction. They will undergo safety instructions for the various items of equipment required to complete the project.
- Students will acquire knowledge by completing the various tasks. Several interdisciplinary tasks will be opened to them, all must be completed (student centred learning will take place).
- It is expected or presumed that students have a prior knowledge of the subjects involved.

TEACHING STRATEGIES:

- Assessment will be based initially on the worksheets i.e. completion and presentation. Student understanding (and therefore assessment) will become obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and will be verbal during practical.
- The project is aimed at student centred learning. The student should be aware of what is required and manage the tasks to suit availability of equipment and stages needed.
- The project has some scope for differentiation in the starting point or the stages (which can be adjusted) required by the teacher.
- This is a highly visual project and students with language difficulties and, to some extent, learning difficulties can follow the step by step pictorial guide in the booklet.

RESOURCES:

- The project will be based across several departments. Access to an ICT room, mathematical resources and social studies are important for full interdisciplinary connections. The previous combination of subjects will eventually combine in a reasonably resourced Design Technology workshop.

FINGER JOINT BOX

An ideal starting project, giving flexibility and limited variation. Enjoyable for pupils, easy on the department budget.

Points of interest

- Easy and enjoyable to make.
- Students can enjoy the finished job.
- Cross curricular with maths and graphics.
- Assessment on accuracy and finish.
- Very limited variation for whole class.

Finger Joint box project basic skills.

- Workshop safety
- Machine safety
- Material selection
- Wood as a medium
- Introduction to joints
- Finishing a project

Trinket box or whatever a small box may be used for. This compact project covers many skills. It is easy on any departmental budget and small enough for compact storage.

Pupils enjoy this project due to its speed of construction, forgiveness of mistakes and the robust appearance of the finished article.

It can also be used for a period of cover lessons. Depending on finish and design lessons, the box could be stretched over a period of ten to fifteen lessons. This is obviously dependent on teaching styles, workshop access and differentiation of pupils.

Teaching points

Easy and enjoyable to make.

Students can enjoy the finished job.

Cross curricular with maths and graphics.

Assessment on accuracy and finish.

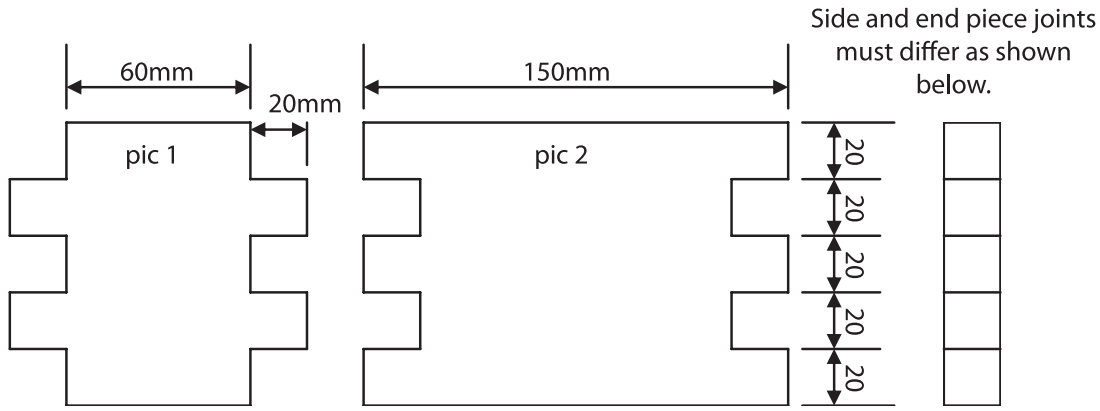
Very limited variation for whole class.

STARTING WITH THE CUTTING LIST:

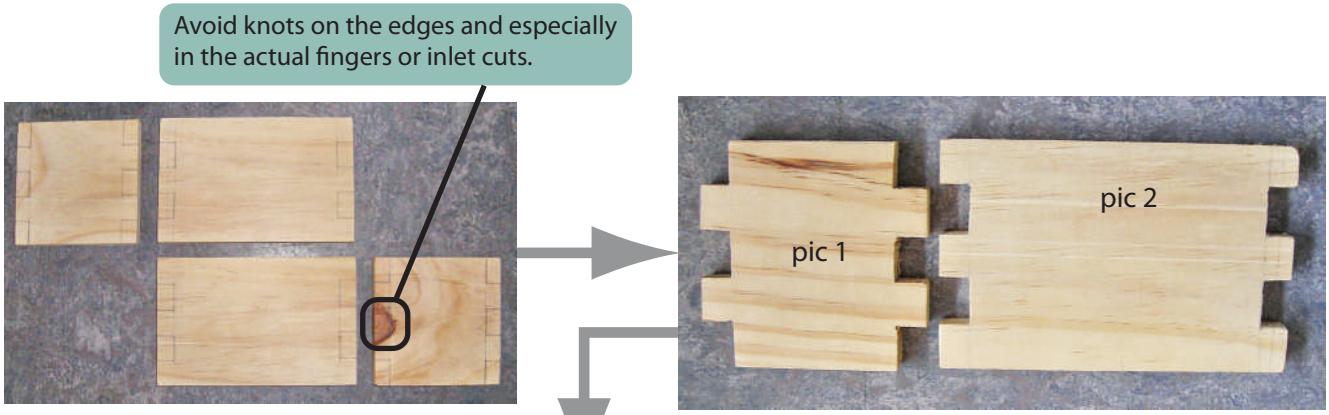
2 off 150mm × 100mm × 20mm (Pine)	See pic 1
2 off 80mm × 100mm × 20mm (Pine)	See pic 2
2 off 150mm × 100mm × 20mm (Pine)	

■ STEP 1 MARKING OUT THE FINGER JOINTS.

TEACHERS SHOULD NOTE THAT STUDENTS WILL ATTEMPT TO CHISEL OUT THE JOINTS. THIS WILL WRECK THE WORK.



Consumable Materials: PVA Glue, Panel Pins, Sandpaper, Paint or Stain and Masking tape.



Four sides of the box marked out.

Two sides of the box cut for finger joints.

If the fingers and finger slots are too tight, the student will have problems making the box square. They may also break or chip the wood if forced.
If the fingers and slots are too loose, the box will lose some of its strength and give a poor appearance.
Accuracy is of high importance. However, some of the weaker students may be unable to achieve this.
Slightly loose joints make the construction easier and can be filled later.

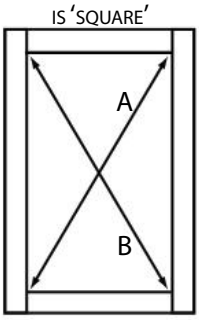
Finger joint box corner.

Teachers should check the students' work at this stage. If incorrect now, the whole project will be wrong.

Use PVA glue only in the joints and square the job. Clamp securely and check again for square.

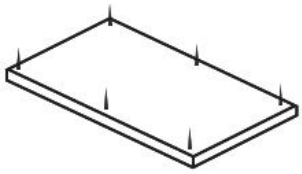
Check for squareness using a rule. Measure the internal distances between corners.

If A = B, the work is 'square'



Once the box sides are glued and dry, excess wood from the finger joints can be removed. It is not necessary to sand the box at this stage as this can be done later when the top and base have been fitted.

The Top and bottom can be fitted using PVA or panel pins or both. If using panel pins it is advisable to sink the head of the pin using a nail punch then covering over the indent.



Try to avoid hammer marks in the wood when using panel pins. These can become very difficult to clean out.

Students like to hammer in nails or panel pins. Six are sufficient to hold the top in place and another six in the bottom.

When all pieces have been fixed and the glue is dry, the box is ready for splitting. Several choices can be offered to the students. A wave cut as seen in the photograph (left), a straight cut, a V cut or an angle cut.

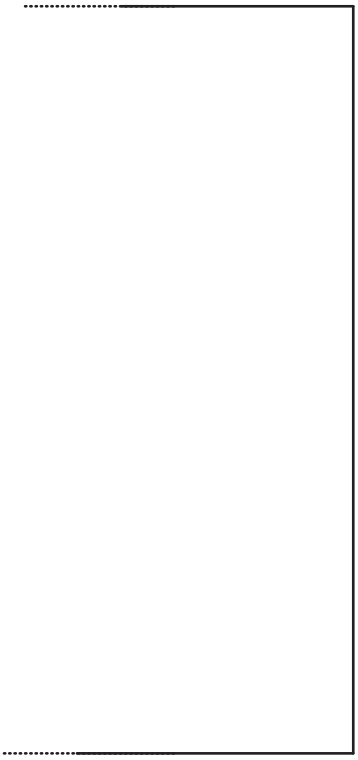
Whatever cut is chosen, avoid the panel pins as they can dull the band saw blade and look unsightly in the finished work.

Another enhancement may be to router the top (as in the photograph (left) various patterns are available.

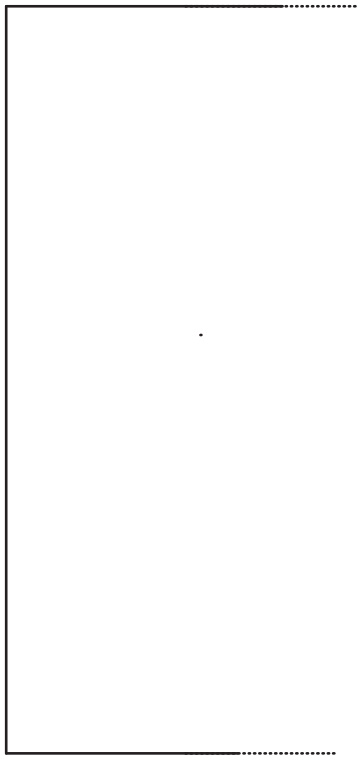
Finally, applying stain or varnish will not only enhance the finish it will also protect it from moisture and other conditions that may affect the project over time.

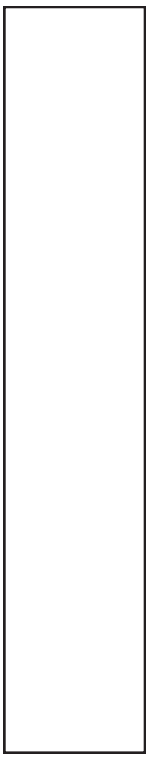
WORKSHEET 1

NAME:_____

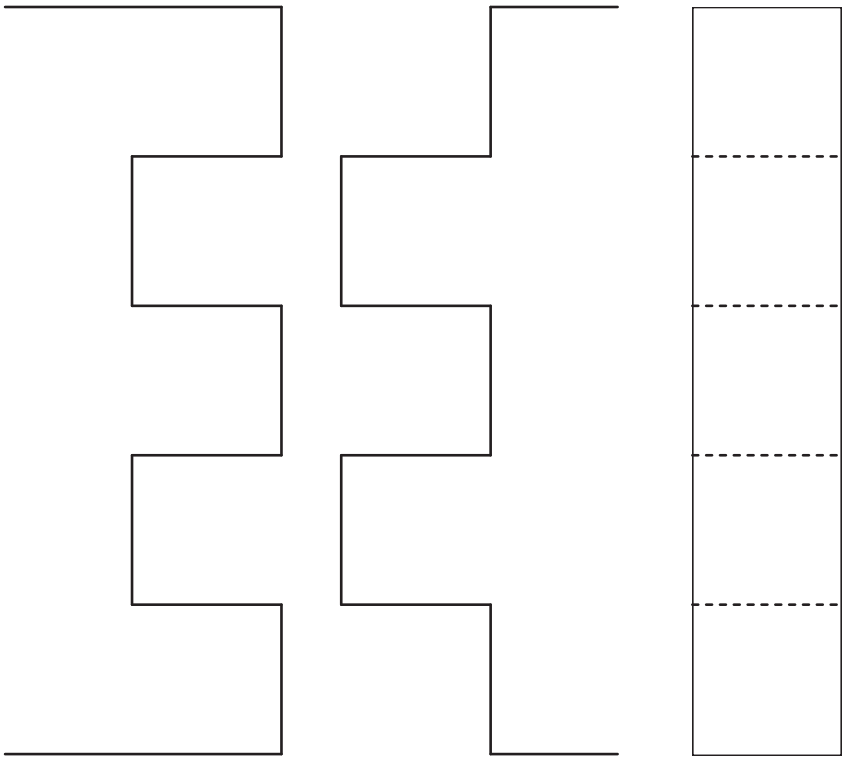


Develop corner section of 20mm finger joints.





Develop End view.



Development should look like this from above.

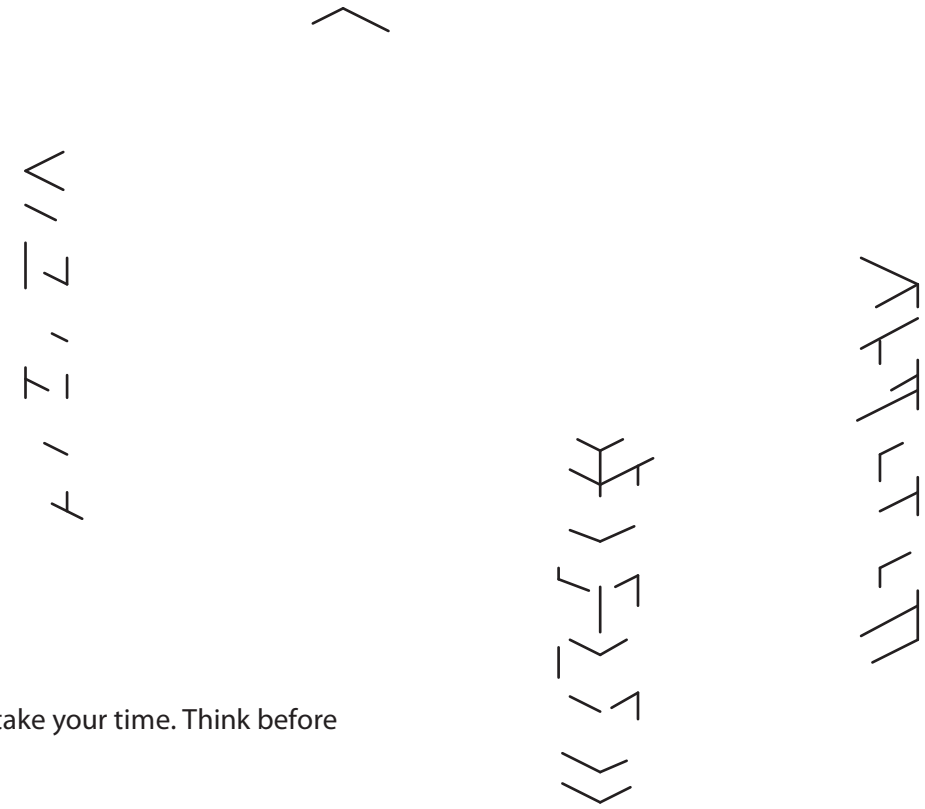
Teacher comment —

Grade —

MYP Design & Technology

Complete the drawing below.

Why ? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished.



Use a rule and take your time. Think before drawing.

1. Name the type of wood used in the pieces of the project. _____

2. Avoid _____ when cutting finger pieces.

3. The grain of the wood should run _____

4. What is the name of the saw used to cut out the pieces _____

5. If the fingers are too big the job will _____ if forced together.

6. If the fingers are too small the parts will ____ __ a _____ fit

7. Split pieces can be glued although they must be allowed to set for _____ hours.

8. When all four sides are cut out, the frame should be glued and _____ .

9. When the glue has dried, the top and base should be fixed on with _____ and _____

10. When cutting the top, avoid the _____

Evaluation (This is an important stage of learning and understanding).

If you could start again, what would you do differently? What went wrong during the making?

What could be better?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Teacher Grade 1 to 6 ☐ Grade yourself 1 to 6 ☐

Name - _____

Class - _____

Teacher - _____

WORKSHEET 2 NAME:_____

With the assistance of the teacher, list all the parts needed and the sizes.

1. _____

2. _____

3. _____

4. _____

150 – 20 – 20 = _____ 100 – 20 – 20 = _____

20 × 5 = _____ 60 + 40 = _____

$\frac{100}{5}$ = _____ 110 + 40 = _____

The volume of the box = Width × Length × Height.

Width (internal) = _____ Length (internal) = _____ Height (internal) = _____

Therefore— W × L × H = _____

The height of the constructed box is _____

The width of the constructed box is _____

The length of the constructed box is _____

Divide this line into 5 equal parts:

How long is each section? _____

Mark 20mm off each end of this line:

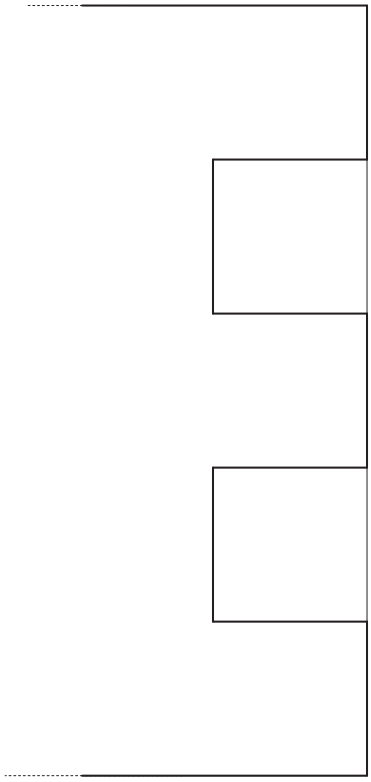
How long is the centre section of the line? _____

If we were to make a separate box so our box could fit inside it exactly, what would the measurements be? -Material 20mm thick.

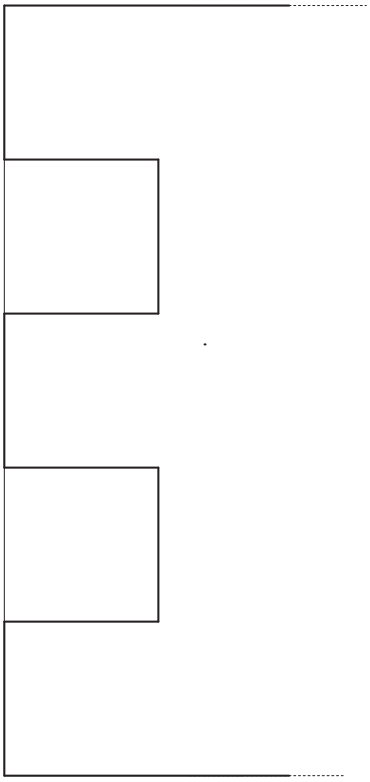
Width = _____ Length = _____ Height = _____

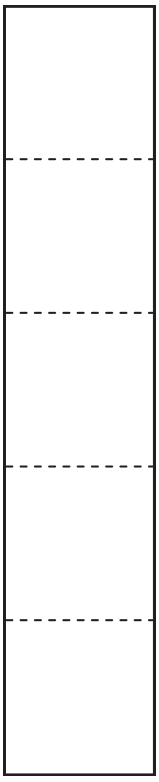
WORKSHEET 1

ANSWERS

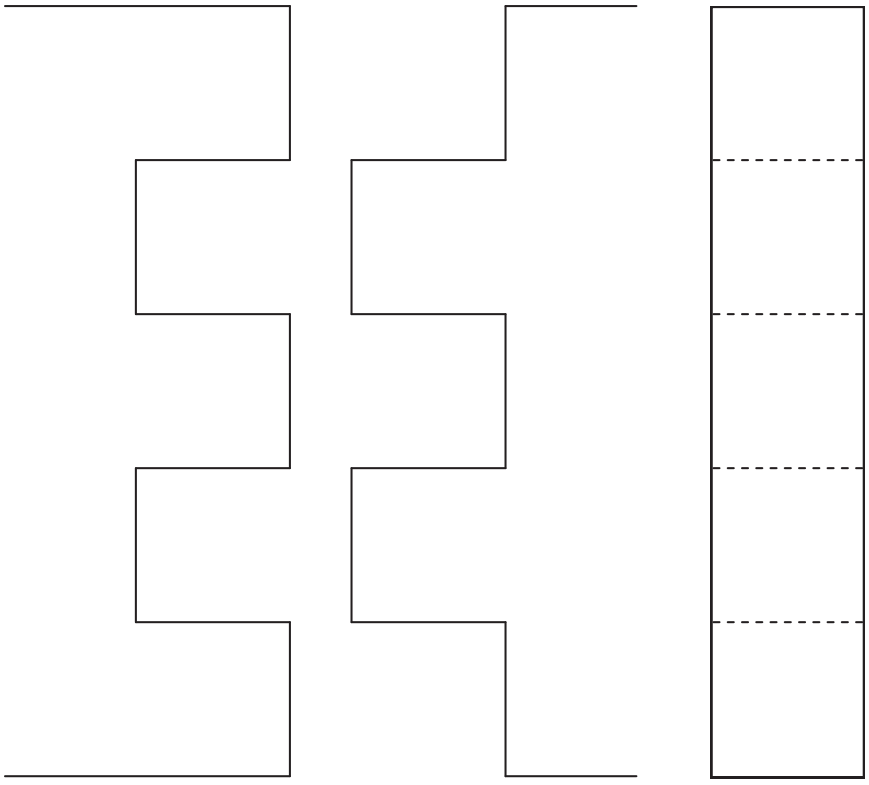


Develop corner section of 20mm finger joints.





Develop End view.

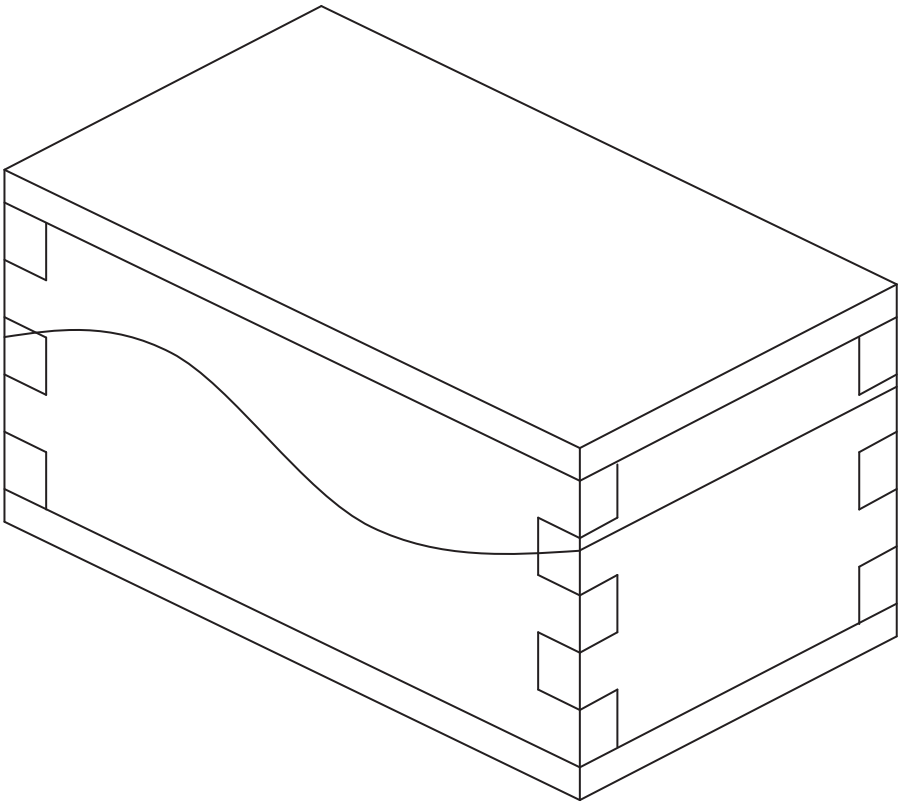


Development should look like this from above.

Teacher comment —

Grade —

MYP Design & Technology



1. Name the type of wood used in the pieces of the project. **Pine (or local equivalent).**
2. Avoid **Knots** when cutting finger pieces.
3. The grain of the wood should run **Horizontally (lengthwise).**
4. What is the name of the saw used to cut out the pieces **Coping saw.**
5. If the fingers are too big the job will **split** if forced together.
6. If the fingers are too small the parts will **not be** a **strong** fit
7. Split pieces can be glued although they must be allowed to set for **24** hours.
8. When all four sides are cut out, the frame should be glued and **squared**.
9. When the glue has dried, the top and base should be fixed on with **glue** and **panel pins**.
10. When cutting the top, avoid the **panel pins**.

WORKSHEET 2 ANSWERS

With the assistance of the teacher, list all the parts needed and the sizes.

1. **2 off 150mm × 100mm × 20mm (Pine)**
2. **2 off 80mm × 100mm × 20mm (Pine)**
3. **2 off 150mm × 100mm × 20mm (Pine)**

150 – 20 – 20 = **110** 100 – 20 – 20 = **60**

20 × 5 = **100** 60 + 40 =**100**

$\frac{100}{5}$ = **20** 110 + 40 = **150**

The volume of the box = Width × Length × Height.

Width (internal) = **60mm** Length (internal) = **110mm** Height (internal) = **100mm**

Therefore— W × L × H = **60 × 110 × 100 = 660 000mm²**.

The height of the constructed box is **140mm**

The width of the constructed box is **80mm**

The length of the constructed box is **150mm**

Divide this line into 5 equal parts:

How long is each section? **20mm**

Mark 20mm off each end of this line:

How long is the centre section of the line? **110mm**

If we were to make a separate box so our box could fit inside it exactly, what would the measurements be? -Material 20mm thick.

Width = **120mm** Length = **190mm** Height = **180mm**

Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem, design brief, client and brainstorm	Project introduction, discussion on box design, construction and problems.	Storyboard, A4 paper. Pre made box. Example material.	English, Maths, IT (research), Graphics. Teacher observation	Collection of images of boxes. A4 sheet. Complete classwork. Freehand sketch.
2	Research and selection of construction, material. Look at existing products.	Isometric demo, visual blow up of joining methods. Investigate products.	A4 paper, examples of joins, box and joint alternative ideas.	English, Maths, IT (research), Graphics and teacher observation.	Compile preferred images. Complete class work. Rough sketch of project.
3	Design ideas: Initial development of design final solution.	Demonstrate initial and development, Final solutions drawing.	A4 paper, Example of each joint in the construction.	Teacher observation. Graphics i.e. design.	Draw joining techniques, Complete classwork.
4	Marking out, measuring and cutting material.	Teacher demonstration of each section. Individual practical session.	Pine (type) wood, pre-cut. PVA, pencils, rules, etc.	Maths, graphical ability, quality and accuracy.	Produce a material and equipment list for lesson tasks.
5	Construction and assembly of box body. Cleaning, evaluating.	Practical lesson to construct box body to pre-paint or stain. Check accuracy.	Pine (type) wood, pre cut. PVA, pencils, rules, sandpaper.	Maths, graphical ability, quality and accuracy. Visual finish.	Student self evaluate the project and compile a list of improvements.
6	Learn importance of accuracy through marking out and checking.	Clean and stain or varnish. Remove loose material.	Project boards, PVA, medium sandpaper, nails.	Maths. Graphical ability. Quality and accuracy. Visual finish.	Students self evaluate the project and compile a list of improvements.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student has not developed the given design brief.	The student has developed on the given design brief and has identified a range of appropriate information.	The student has developed on the given design brief. They identified and acknowledged a range of appropriate information.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student follows the given plans with little or no adaptation.	The student has understood the project and enhanced the design to suit his/her own ideas.	The student has clearly visualized the given project and adapted the criteria to suit his/her own individual design ideas.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student has followed the given scheme.	The student has generated two acceptable designs that meet the specification.	The student has generated several feasible designs that meet the specification and justifies his/her final choice.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product according to the given design, working safely through the unit.	The student created the product according to his/her individual design. S/he has completed the table to a reasonable standard, working safely through the unit.	The student created the product according to their individual design. They have completed the design.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student evaluates his/her use of the design cycle.	The student evaluates his/her use of the design cycle, and suggests how his/her performance could be improved.	The student evaluates their use of the design cycle. S/he evaluates his/her performance at each stage and suggests how it could be improved.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provides evidence of personal engagement with the subject.	The student provides evidence of personal engagement with the subject i.e. - motivation, positive attitude.	The student provides evidence of personal engagement with the subject i.e. - motivation, positive attitude and independence.

TIME FRAME AND DURATION

- 6 to 8 Weeks at 2 × 45 min lessons per week.

AREA OF INTERACTION:

- Approaches to Learning, Human Ingenuity.

INTERDISCIPLINARY, CURRICULUM LINKS WITH:

- Maths.

SIGNIFICANT CONCEPTS:

- Outline the design brief.
- Justify or logically disagree with the given design.
- Generate several (3) feasible designs that meet the design specification.
- Use a range of appropriate techniques and equipment competently.
- Evaluate the success of the product/solution in an objective manner based on testing.
- Provide evidence of personal engagement with the subject.

MYP UNIT QUESTION

- Why is it important to know how to use correctly the tools and machinery in a technology workshop?

Sub questions:

- Why should we know the project before making it?
- Why is accurate marking out important?

ASSESSMENT: STUDENTS WILL:

- Complete the worksheets provided specifically for this project.
- Accurately mark out work using the previously completed worksheets.
- Follow the stages correctly for fabrication of the project, using appropriate tools and machinery.
- Produce a dimensioned isometric drawing of the finished project.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate, Plan, Create, and Evaluate, attitudes in technology.

ASSESSMENT CRITERIA TO BE USED:

- A, C, D, E and F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- Mathematical skills, for the marking out and preparation prior to fabrication.
- English skills for the understanding of the task to be performed.
- Art experience for the ability to draw and create working diagrams, drawings.

APPROACHES TO LEARNING:

- The unit is aimed at developing students' basic understanding of the processes involved in design technology. They will become familiar (by use) with tools and equipment as well as the safety aspects involved.

LEARNING EXPERIENCES:

- The students will initially work from the pre developed worksheets to gain an understanding of the unit. They will see finished work prior to starting to show direction. They will undergo safety instructions for the various equipment required to complete the project.

- Students will acquire knowledge by completing the various tasks. Several tasks will be opened to them, all must be completed (student centred learning will take place).

- It is expected or presumed that students have little or no prior knowledge of the subject.

TEACHING STRATEGIES:

- Assessment will be based initially on the worksheets i.e. completion and presentation. Student understanding (and therefore assessment) will become obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and will be verbal during practical.

- The project is aimed at student centred learning. The student should be aware of what is required and manage the tasks to suit availability of equipment and the stages needed.

- The project has huge scope for differentiation as in the starting point or the stages (which can be adjusted) required by the teacher.

- This is a highly visual project and students with language difficulties and, to some extent, learning difficulties can follow the step by step pictorial guide in the booklet.

RESOURCES:

- The project will be based solely in the DT room to allow students to become familiar with the workshop. However, constant reference to external manufacturing and material availability will be required.

FLASHING BADGE

An ideal starting project that fits nicely into the introduction to control scheme of electronics.

Points of interest

- Easy and enjoyable to make.
- Students can play with the finished job.
- Cross curricular with maths, graphics, art and science.
- Assessment on accuracy and finish.
- Limited variation for whole class.

Flashing Badge project basic skills.

- Workshop safety
- Machine safety
- Material selection
- Soldering as a medium
- Importance of accuracy
- Finishing a project

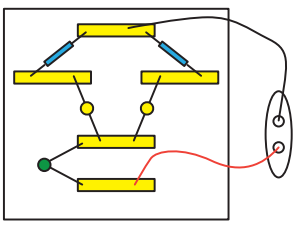
The electronic flashing badge fits nicely into the introduction to control and variation. Two standard LEDs are pulsed by one flashing LED.

A simple, although effective, project aimed at early secondary students or those starting out in the study of control.

As electronics projects go this is relatively inexpensive and simple to construct. Due to its simplicity it is easy for the student to understand and therefore, if needed, problem solve.

Variations of picture and design should be left up to the students to give them ownership and help them value their project.

Uses a 9V battery.



Teaching points

Look out for badly soldered joints.

Note the positive and negative sides of the LEDs.

Allow the paint to dry before drilling.

5mm holes and 5mm LEDs work well.

Sometimes, when soldering to the copper tape, the glue melts and will no longer stick.

LEDs must be in sequence.

STARTING WITH THE MATERIALS LIST:

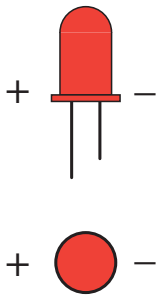
1 off 200mm self adhesive copper tape

2 off 5mm standard LEDs

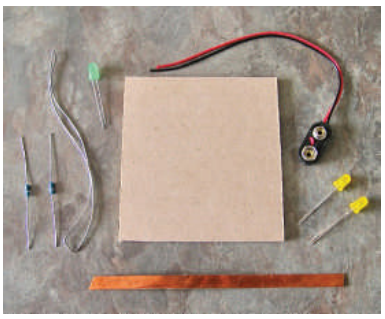
1 off 5mm flashing LED

2 off 390 ohm resisters

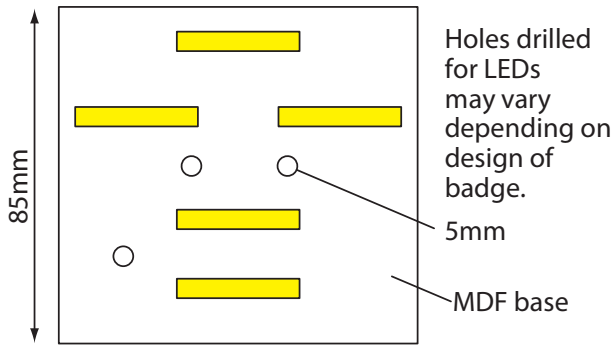
1 off



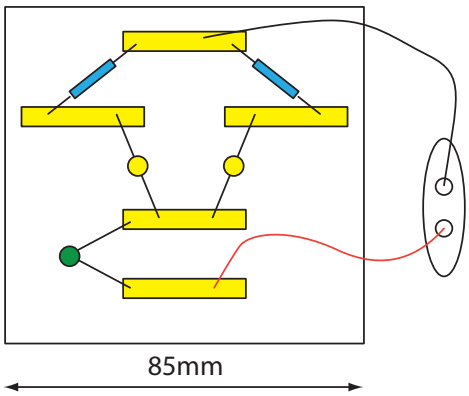
battery



snap

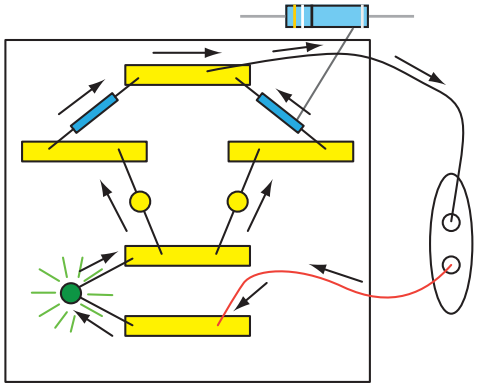


Self adhesive copper tape layout on the back of the badge.

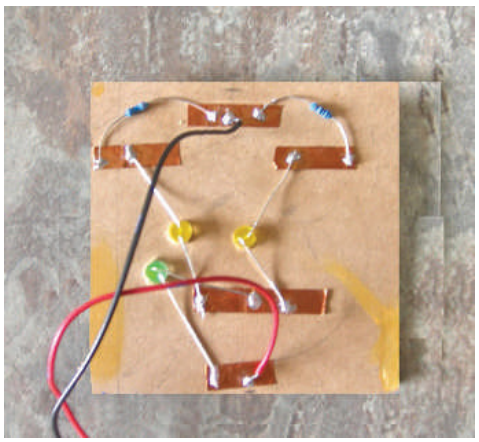


Consumable Materials: Solder.

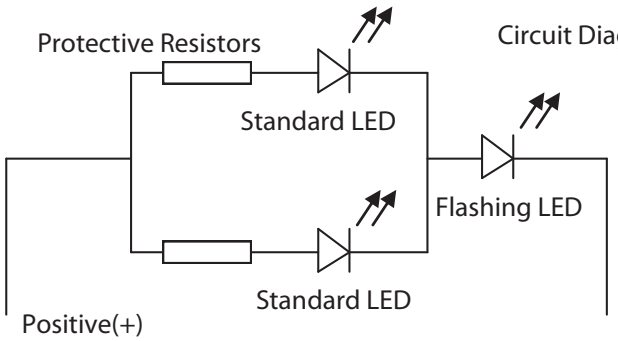
Follow the arrows to see the flow from positive to negative.



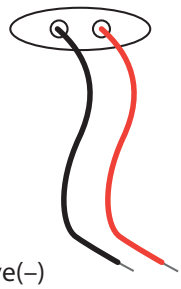
The GREEN LED is a flashing or pulsating LED. This causes the rest of the circuit to flash.



Soldered Badge

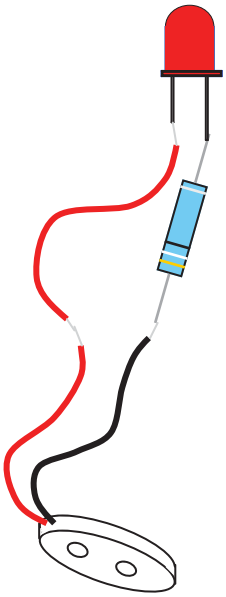


Circuit Diagram

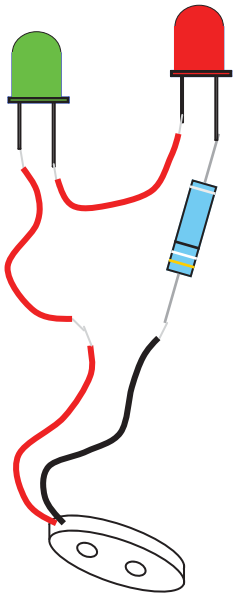


Front of badge

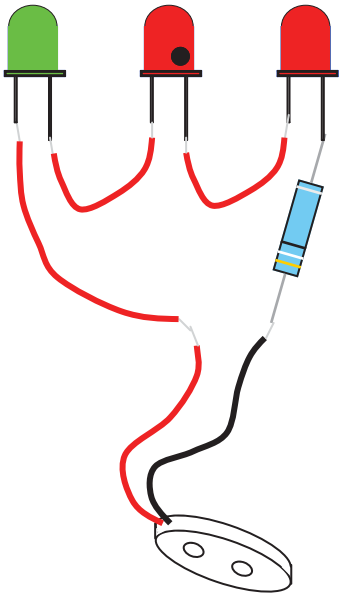
Construction stages of the circuit.



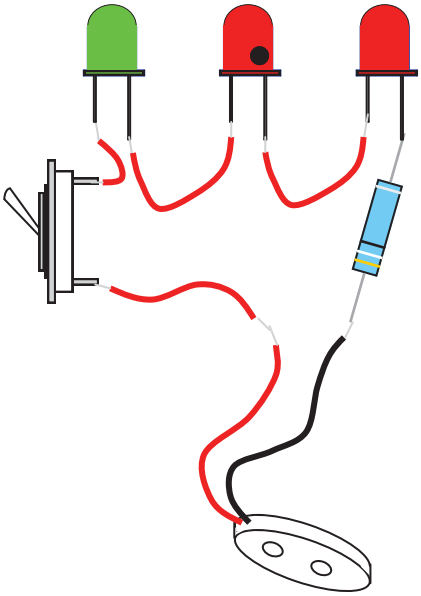
1. Flow lights the LED and is protected by the resistor.



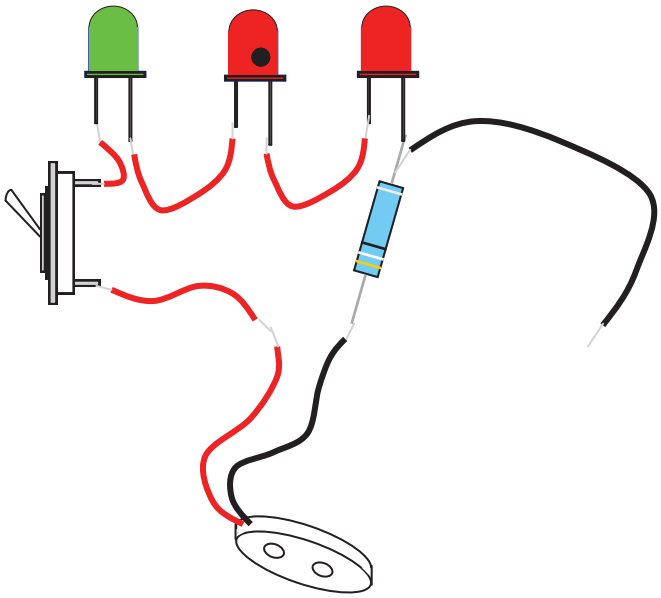
2. Flow lights the 2 LEDs and is protected by the resistor.



3. Flow lights the 3 LEDs, although the middle one is a flashing LED. Having a flashing LED in the circuit causes the others to flash.



4. The switch causes the circuit to turn on or off.



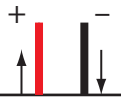
5. Adding a flying wire will give control to the circuit and you can now isolate individual LEDs.

WORKSHEET 1 NAME:_____

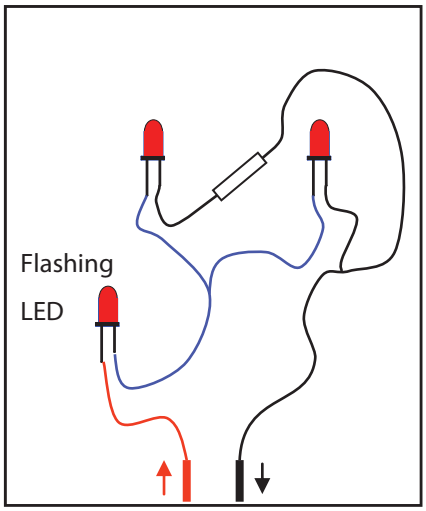
On a piece of A4 paper draw four 85mm × 85mm boxes. In each box, draw a design for a flashing badge. Colour each badge and mark out three 5mm holes for the LEDs. Choose one badge and draw it in the left box below (A). In the right box, (B), draw the circuit you will use (The back of the badge).

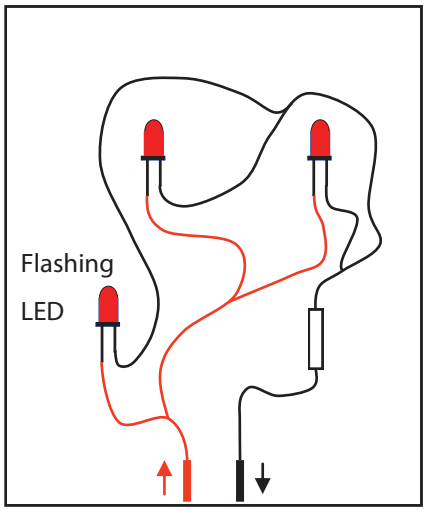
A

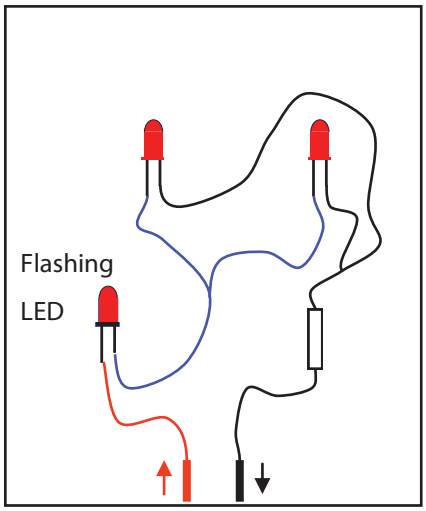
B



Only one of the sketches below is the correct one. You pick one and draw it to fit the box (B) above.







Teacher comment:

Grade:

MYP Design & Technology

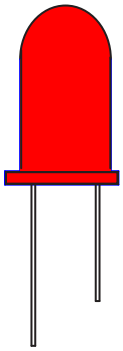
WORKSHEET 2

NAME:_____

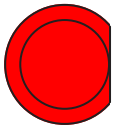
LEDs AND RESISTORS

How to find the + (positive)

And the – (negative) on a LED



The positive leg is always the longer of the two legs



On the rim of the LED there is a flat part. The leg below this is always the negative.

This is a resistor.

A resistor restricts the flow of electricity around the circuit. Without a resistor, the LEDs in our circuit would burn out and stop working.

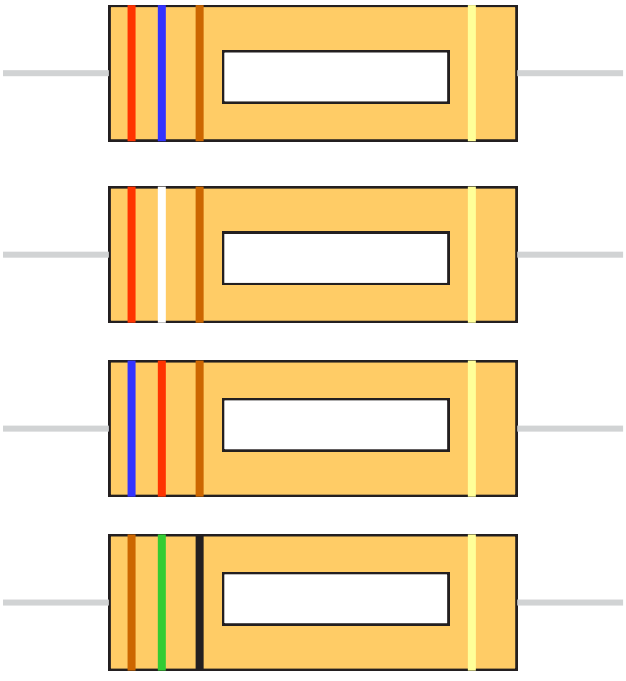
The colours on the resistor tell us how much it will restrict the flow of electricity.

This chart tells us how to find the resistance of a resistor.

(The fourth band, gold or silver, is not important)

Colors	First Band	Second Band	Third Band
Black	0	0	-
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Violet	7	7	0000000
Gray	8	8	00000000
White	9	9	000000000

1. Find the resistance of the following. Write your answer in the white box in the resistor.



In the box below, draw a LED with the negative leg on the left.

MYP Design & Technology

WORKSHEET 3 NAME:_____

How was the circuit made? Explain how it works? Use all the page for your answer.

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 4 NAME:_____

1. What does AC stand for?_____

2. What does DC stand for?_____

3. What word do we use for this symbol (+)?_____

4. What word do we use for this symbol (–)?_____

5. How many volts do we use in the battery for this project?_____

6. How many volts do we use in our homes?_____

7. What does LED stand for?_____

Evaluation (This is an important stage of learning and understanding). If you could start again, what would you do differently? What went wrong in the making? What could be better?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

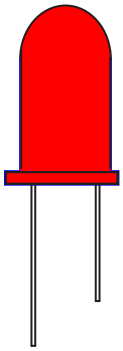
Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 2

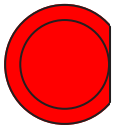
LEDs AND RESISTORS

How to find the + (positive)

And the – (negative) on a LED



The positive leg is always the longer of the two legs



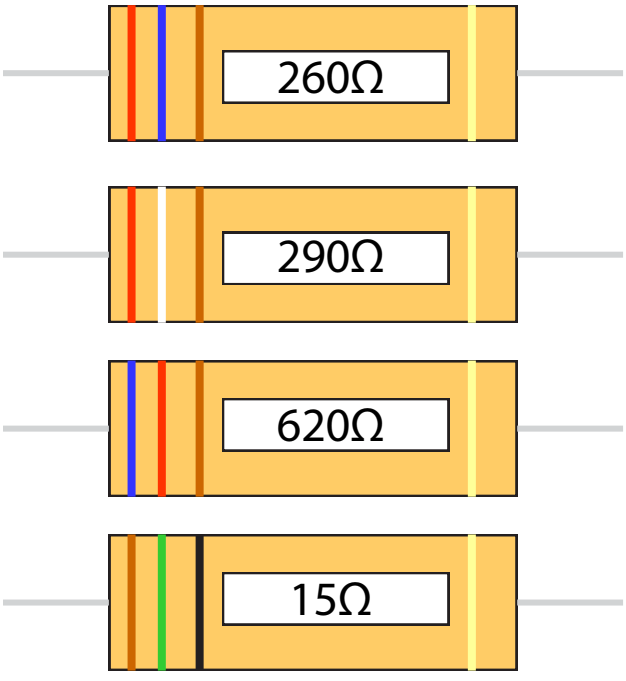
On the rim of the LED there is a flat part. The leg below this is always the negative.

This chart tells us how to find the resistance of a resistor.

(The fourth band, gold or silver, is not important)

Colors	First Band	Second Band	Third Band
Black	0	0	-
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Violet	7	7	0000000
Gray	8	8	00000000
White	9	9	000000000

1. Find the resistance of the following. Write your answer in the white box in the resistor.



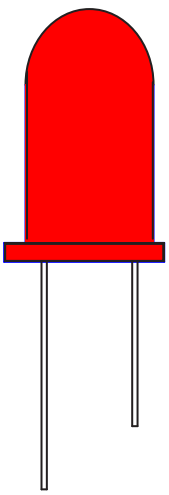
ANSWERS

This is a resistor.

A resistor restricts the flow of electricity around the circuit. Without a resistor, the LEDs in our circuit would burn out and stop working.

The colours on the resistor tell us how much it will restrict the flow of electricity.

In the box below, draw a LED with the negative leg on the left.



WORKSHEET 4

ANSWERS

1. What does AC stand for? — Alternating Current

2. What does DC stand for? — Direct Current

3. What word do we use for this symbol (+)? — Positive

4. What word do we use for this symbol (–)? — Negative

5. How many volts do we use in the battery for this project? — 9V

6. How many volts do we use in our homes? — 240V (110V in USA and some other places).

7. What does LED stand for? — Light Emitting Diode

Evaluation (This is a important stage of learning and understanding). If you could start again, what would you do differently? What went wrong in the making? What could be better?

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem, design brief, client and brainstorm	Project introduction, discussion, on badge design, construction and problems.	Storyboard, A4 paper. Pre-made badge. Example material.	Maths, IT, (research), Graphics. Art, Observation.	Collection of various images (4).LEDs marked on paper.
2	Research of construction, material selection, Close look at wiring.	Visual of possible wiring solutions. Investigate, LEDs, (flashing) .	A4 paper, Examples of planning, Alternative ideas. Fabrication points.	English, Maths, IT (research), Art. Observation.	Compile preferred strategies. Rough sketch plan and parts.
3	Marking out wood, cut to shape, paint, drill holes	Teacher demo of each section. Individual practical session. Use of hand/ machine tools.	MDF (type) wood (3mm), pre-cut squares. PVA, pencils, rules, etc.	Maths, graphical ability, quality and accuracy. Art. Observation.	Produce a material and equipment list used for lesson tasks.
4	Finish cutting and cleaning. Insert LEDs.	Practical lesson to finish cutting and drilling. Cleaning using sandpaper.	MDF (type) wood (3mm), pre-cut squares. PVA, pencils, rules, etc.	Maths, graphical ability, Quality and accuracy. Teacher observation.	Student to self evaluate the project. List of personal improvements.
5	Learn importance of accuracy through marking out and planning.	Practical lesson. Begin wiring of the components. Soldering and Tinning.	Projects PVA, sandpaper, pencils, rules, Soldering equipment.	Maths, graphical ability, quality and accuracy.	Student self evaluate the project and compile a list of improvements.
6	Learn importance of accuracy through marking out and planning.	Practical lesson. Continue wiring of the components. Soldering and Tinning.	Projects, PVA, sandpaper, soldering equipment.	Maths, graphical ability, quality and accuracy. Finished job.	Student self evaluate the project and compile a list of improvements.
7	Learn importance of accuracy through marking out and planning.	Finish practical work, clean and paint. Test the project. Evaluate finished job.	Project, sandpaper, paint, soldering equipment.	Maths, graphical ability, quality and accuracy. Observation	None, take project home.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student shows basic understanding of the circuit, the parts used and how it works. Teacher delivery, graded in essay.	The student shows reasonable understanding of the circuit, the parts used and how it works. Teacher delivery, graded in essay.	The student shows competent understanding of the circuit, the parts used and how it works. Teacher delivery, graded in essay.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student does not understand the constraints on the project although does have some creative ideas that can be adapted.	The student vaguely understands the constraints on the project yet keeps his/her designs within these boundaries with clear and practical ideas.	The student clearly understands the constraints on the project and keeps his/her designs within these boundaries with varied yet sensible ideas.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student generates one design and works on that one alone.	The student generates some designs that fit into the design specification.	The student generates several designs that meet the design specification.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student uses a range of appropriate techniques and equipment safely. S/he follows the plan to produce the product / solution and does so to a basic standard.	The student uses a range of appropriate techniques and equipment adequately. They follow the plan to produce the product / solution and do so to an acceptable standard.	The student uses a range of appropriate techniques and equipment competently. S/he follows the plan to produce the product / solution and does so to a high standard.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student suggests ways his/her product / performance could be improved.	The Student evaluated the success of his/her design.	The Student evaluated the success of his/her design and the materials used. S/he suggests ways his/her product could be improved.

	0 Level	1-2 Level	3-4 Level	5-6 Level
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student carries out units of work in technology using materials and techniques safely.	The student carries out units of work in technology using materials and techniques safely.	The student carries out units of work in technology using materials and techniques safely and responsibly.

TIME FRAME AND DURATION

- 7 to 9 Weeks at 2 × 45 min lessons per week.

AREA OF INTERACTION: - HUMAN INGENUITY, APPROACHES TO LEARNING.

- Interdisciplinary, Curriculum Links with: - Maths, Science, Art.

SIGNIFICANT CONCEPTS:

- Outline and understand the design brief.
- Justify or logically disagree with the given design.
- Use and apply ICT effectively as a means to access, process and communicate information, and to solve problems.
- Use a range of appropriate techniques and equipment competently.
- Provide evidence of personal engagement with subject.
- Collect, analyse, select, organize and evaluate information.

MYP UNIT QUESTION

- How does a circuit work?

Sub questions:

- How do we adapt and control a circuit?

- What are the governing restraints on circuit size?

ASSESSMENT: STUDENTS WILL:

- Gain a basic understanding (Via lesson(s)) of what is a circuit and how it works.
- Complete the worksheets provided (specifically for this project).
- Follow the stages correctly for fabrication of the one LED project (test the circuit).
- Add and expand the project through the set steps
- Ensure a safe working environment at all times.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate, Design, Plan, Create, Evaluate, AiT

ASSESSMENT CRITERIA TO BE USED:

- A, B, C, D, E and F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- Basic hand tool and minor machine skills for the fabrication of the project.
- Workshop safety, in particular soldering irons.

APPROACHES TO LEARNING:-

- The unit is designed to introduce students to basic electronic circuits and how they can be manipulated. Strong emphasis is placed on "Student Centred Learning" as s/he should already hold a basic knowledge of hand tools.

LEARNING EXPERIENCES:

- After completing the pre developed worksheets along side lesson introduction. The student should be able to individually work on the practical parts of the unit.
- Students will acquire knowledge by completing the various tasks. It is expected or presumed that students have a little prior knowledge of the subject gained in previous units before beginning this project.
- At the end of the unit the student should comprehend how a circuit works and how to alter a circuit to vary its function.
- Students will also gain a better insight into soldering, repairing circuits and dismantling soldered joints.

TEACHING STRATEGIES:

- Assessment will be based on the description (essay) on how the circuit was made, evaluation and completion of the practical. Student understanding (and therefore assessment) will become more obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and through verbal discussions during practical.
- The project is aimed at student centred learning. Whereby the student is aware of what is required and manages the tasks to suit availability of equipment and stages needed.
- The project has huge scope for differentiation as in the starting point or the stages (can easily be adjusted) as required by the teacher.
- This is a highly visual project and students with language difficulties and to some extent learning difficulties can follow the step by step pictorial guide in the booklet.

RESOURCES:

- The project will be based solely in the DT room to allow students to become familiar with the workshop. However constant reference to external manufacturing and material availability will be referenced.

JIGSAW

An interesting project, giving controlled flexibility although limited variation. Enjoyable for pupils and easy on the department budget.

Project for Early Secondary

Points of interest

- Easy and enjoyable to make.
- Students can play with the finished job.
- Cross curricular with Maths and Graphics.
- Assessment on accuracy and finish.
- Limited variation for whole class.
- Jigsaw puzzle project intermediate skills.
- Introduction to the workshop.
- Finger Joint box project basic skills.

Workshop safety

- Machine safety
- Material selection
- Wood as a medium
- Importance of accuracy
- Finishing a project

An interesting, although simple, project aimed at the first few years of secondary technology. This project also has optimum flexibility for differentiation across school year groups.

Most components are prepared prior to the lesson so students should find it easy to engage with minimal supervision.

It is a compact intermediate project and weaker students find it relatively easy to keep pace whilst all students should develop good workshop practice.

The stages of manufacture have been completed to aid the advancement of the class as a unit rather than as individuals.

Points to look out for

Try to keep the frame around the base as square and accurate as possible.

Do not allow the glue to dry on the two plate pieces.

Let the glue dry enough to hold the plates together

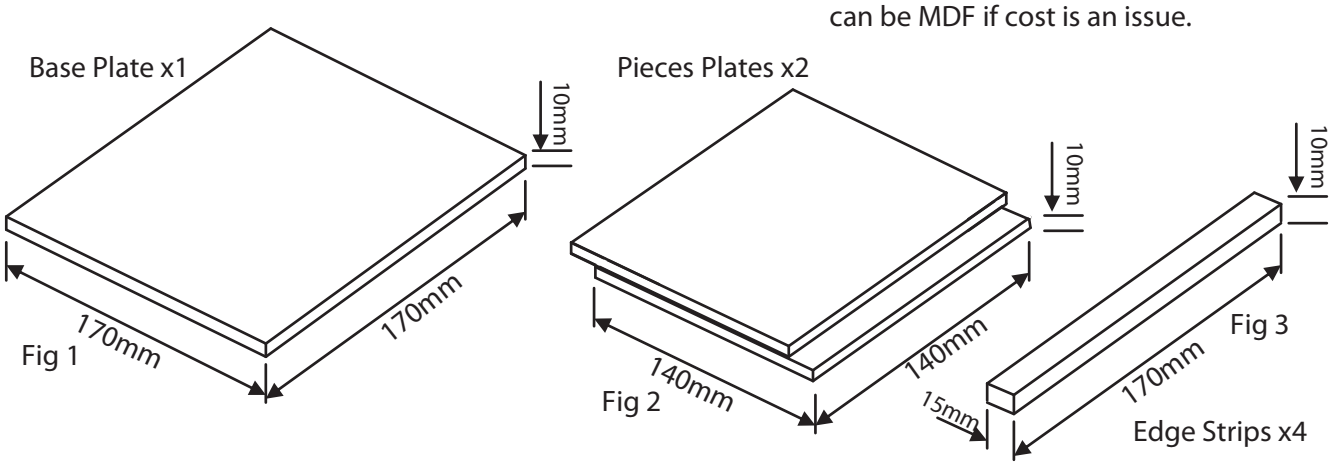
Don't make the jigsaw to complicated or intricate.

Routing the base will give a better finish

STARTING WITH THE CUTTING LIST:-

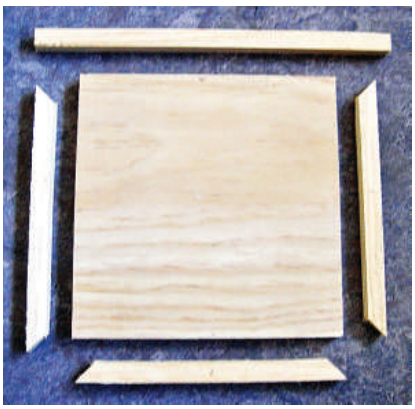
1 of 150mm × 100mm × 20mm (Pine)	See pic 1	Square cut plate.
2 of 100mm × 25mm × 5mm (Pine or MDF)	See pic 2	Two square cut plates.
4 of 150mm × 100mm × 6mm (MDF)	See pic 3	Four strips.

All could be pine or hardwood although can be MDF if cost is an issue.



Consumable Materials :- PVA Glue, Sandpaper, Paint or Stain.

Step 1: Laying out and gluing the base and edges.



Base and edging laid out

With careful alignment the borders should be PVA glued and left to dry.

At this stage it is better to try and keep the edges as square as possible, rather than follow the shape of the base.

Base and edging glued in place

Corners should be cut at 45˚.

This will work if the base is square.

Clean angles with sandpaper for better fit.

Step 2: Routing / Staining the base and edges (optional).

Base plate Routed

Once routed (if desired) the base can be stained and waxed. This will help with the playing of the finished game.

Base plate stained

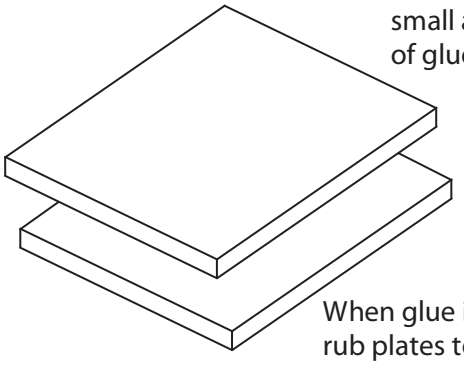
TIP

Routing the edges can help disguise faults such as the edging being out of line or not square.

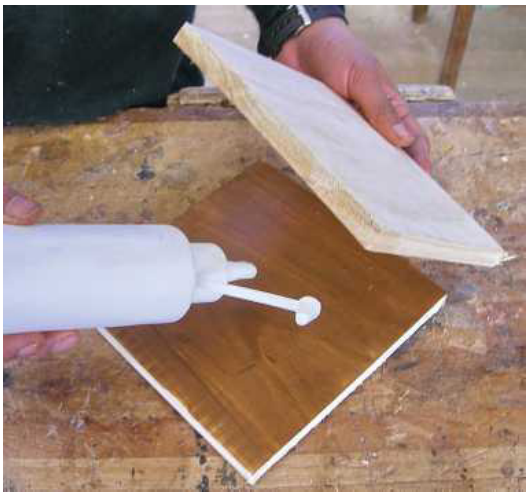
Step 3: Preparing the jigsaw plates for cutting

Glue the plates together exactly so they can be both cut into pieces. The top plate being identical to the bottom plate but differing by grain or stain.

An even but small amount of glue is best.



When glue is applied, rub plates together to even it out.

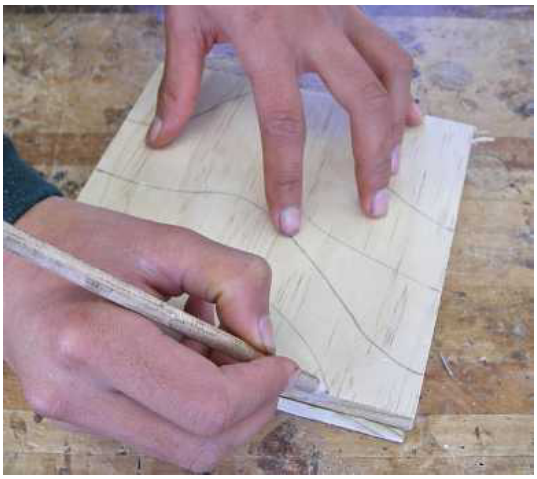


Gluing the two plates together

Avoid using pins to hold the plates as this will mark the finished project.

Very important - Do not allow the glue to dry so that the plates cannot be split again.

Step 4 Marking and cutting the pieces.

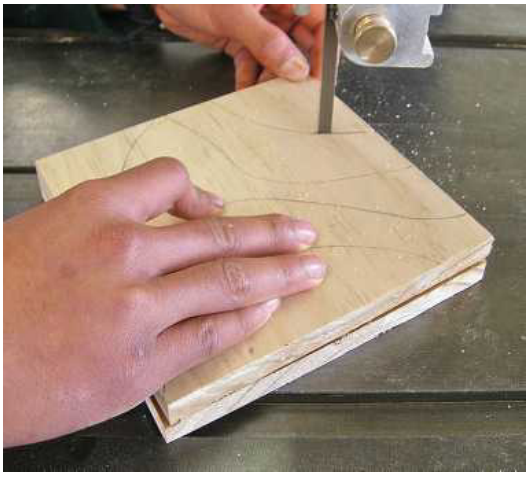


Marking out jigsaw pieces.

When marking, keep it simple. Avoid sharp turns.

Shapes can be cut with either a coping saw or band saw.

Once cut, carefully separate top and bottom pieces.



Cutting out jigsaw pieces

Cut out jigsaw pieces

PIECES

By raising alternate parts, you should now have two sets of opposite, although identically shaped jigsaw pieces.

This is ideal for two jigsaws, spares, or working in pairs.

Weaker students, and those that go wrong, can utilize the excess.

Cut out jigsaw pieces in base.

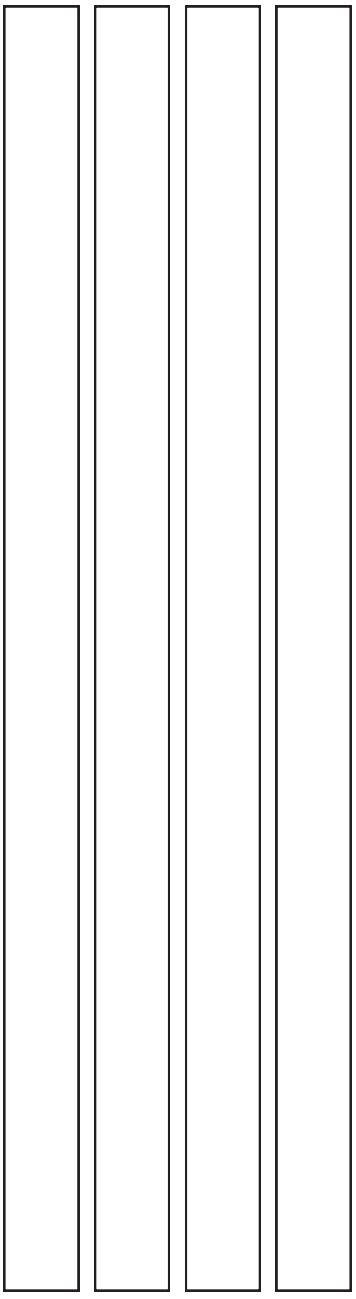
The finished jigsaw should be well sanded and waxed for smooth and good feel.
Avoid knots in wood if possible.

WORKSHEET 1 NAME:_____

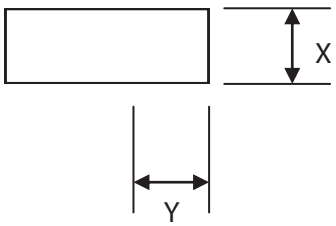
Before marking out on wood, mark on the templates below.

Draw a 10mm border inside the box shape below. Make joins at the corners 45°.

Mark the ends of the four shapes below at 45°



Once a 10mm border has been drawn try designing how the jigsaw will look. On the next page are four practice squares to try a few. Keep one for the final design.



If X = 10 then Y must = 10 to give a 45° angle

Teacher comment—

Grade—

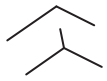
MYP Design & Technology

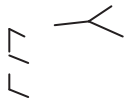
WORKSHEET 2

NAME:_____

Complete the drawing below.

Why ? Because knowing your project will make the task so much easier and you can visualize what it will look like when it is finished.





1. Name 2 common (local) types of wood with differing shades. _____ & _____
2. MDF stands for _____ _____ _____ ?
3. What saw should be used for cutting the angles _____ _____ ?
4. What saw should be used for cutting out the jigsaw _____ _____ ?
5. Avoid sanding _____ the grain of the wood.
6. Is pine a hard or soft wood _____ ?
7. Briefly describe the characteristics of a hard wood
8. Briefly describe the characteristics a soft wood _____

   _____

   _____
9. Briefly describe the characteristics of MDF _____

   _____
10. Briefly describe the characteristics of plywood _____

    _____

WORKSHEET 3 NAME:_____

With the assistance of the teacher, list all the parts needed and sizes.

1. _____

2. _____

3. _____

AREAS

The surface area of a item = Width × Length.

Top surface area of side strips = _____mm²

Top surface area of base = _____mm²

Top surface area of base – side strips = _____mm²

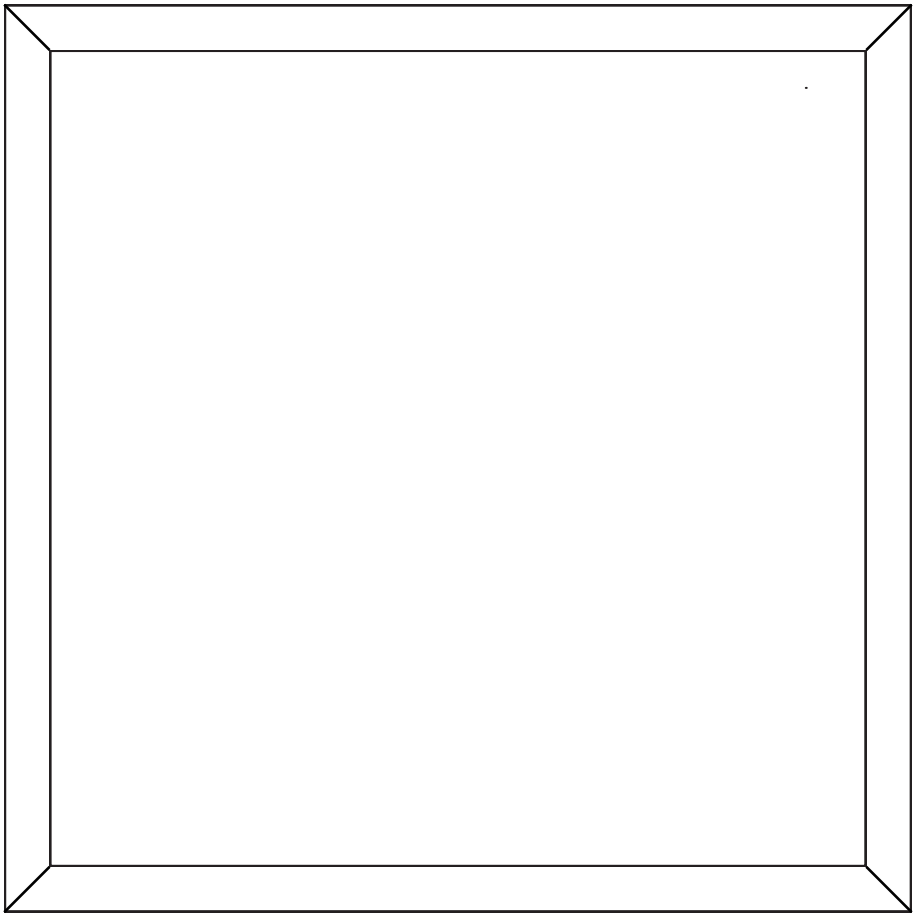
1. 170mm – 10mm – 10mm = _____
2. 90° – 45° = _____
3. 90° + 90° + 90° + 90° = _____
4. 170mm × 170mm = _____
5. 150mm × 150mm = _____

6. Once the edging has been cut, each one at _____° they are then glued into place using _____ glue and left to dry for _____ hours. For accuracy, a measurement can be taken from corner to _____. These should be equal. For the jigsaw, _____ plates of 10mm should be glued together but not long enough to _____. Cut the plates on a _____ _____ or use a _____ _____ . Break the cut plates apart and arrange the jigsaw. Sand, clean and stain if necessary.
7. What is the surface area of the actual jigsaw without the holding tray?
   (Hint, find the area of the main block and subtract the area of the four side strips is one method)
   Answer: _____

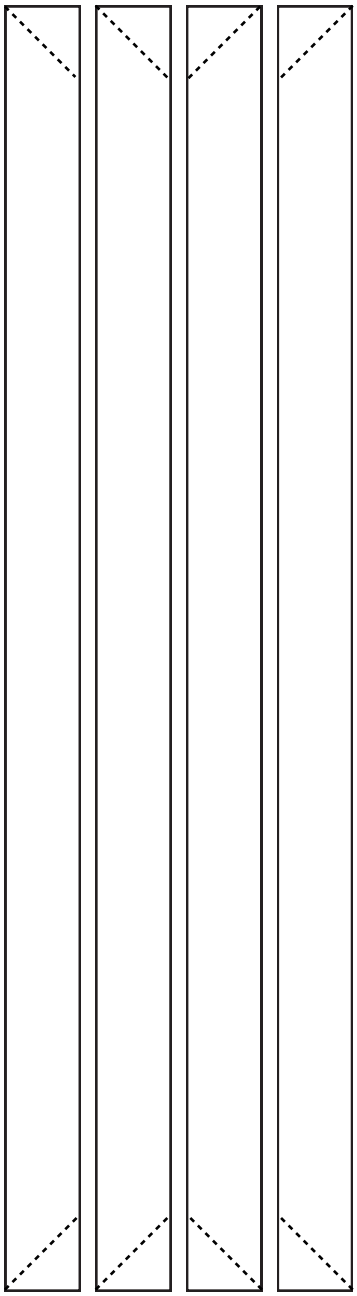
WORKSHEET 1 ANSWERS

Before marking out on wood, mark on the templates below.

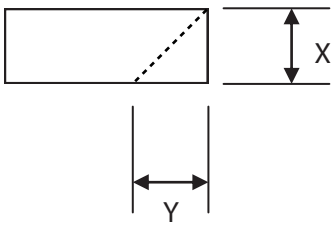
Draw a 10mm border inside the box shape below. Make joins at the corners 45°.



Mark the ends of the four shapes below at 45°



Once a 10mm border has been drawn try designing how the jigsaw will look. On the next page are four practice squares to try a few. Keep one for the final design.



If X = 10 then Y must = 10 to give a 45° angle

Teacher comment—

Grade—

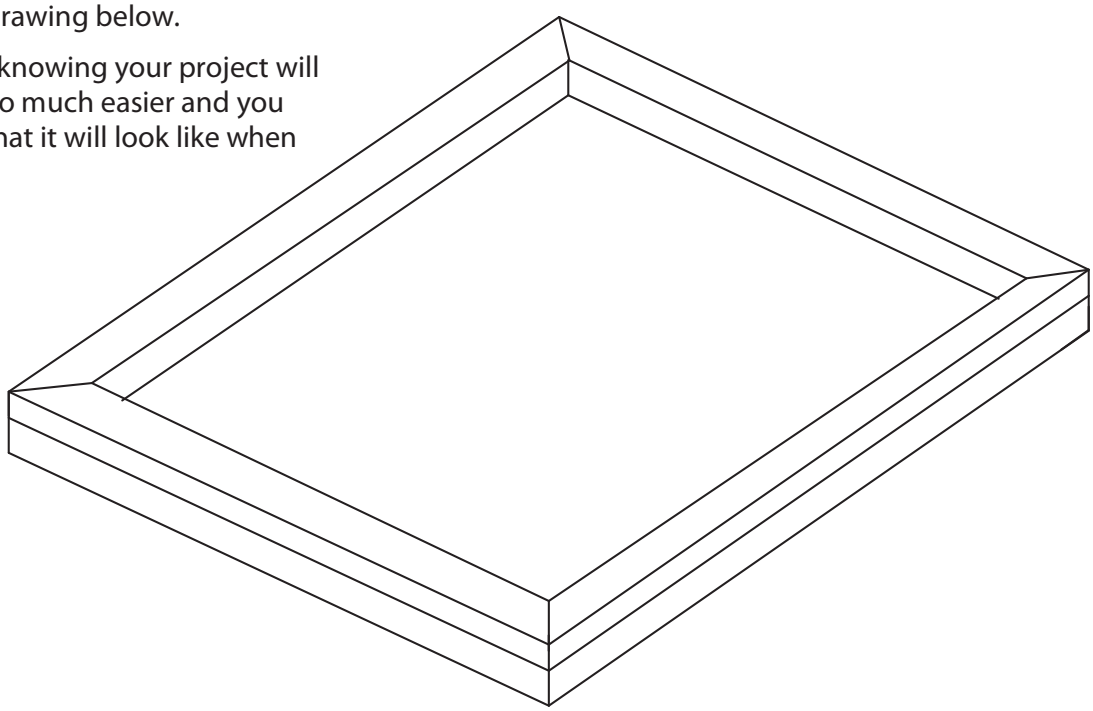
M Y P D e s i g n & T e c h n o l o g y

WORKSHEET 2

ANSWERS

Complete the drawing below.

Why ? Because knowing your project will make the task so much easier and you can visualize what it will look like when it is finished.



1. Name 2 common (local) types of wood with differing shades. **pine & oak (many correct answers)**
2. MDF stands for **Medium Density Fibre**
3. What saw should be used for cutting the angles **Tenon Saw**.
4. What saw should be used for cutting out the jigsaw **Coping Saw**
5. Avoid sanding **across** the grain of the wood.
6. Is pine a hard or soft wood. **soft**
7. Briefly describe the characteristics of a hard wood. **Generally a hard wood tree produces nuts or berries.**
8. Briefly describe the characteristics a soft wood **Generally a soft wood tree produces cones.**
9. Briefly describe the characteristics of MDF. **MDF is wood shaved into fibers and compressed using glue as a bonding agent.**
10. Briefly describe the characteristics of plywood **Plywood is thin layers of various woods laid with the grains at right angles to each other.**

WORKSHEET 3 ANSWERS

With the assistance of the teacher, list all the parts needed and sizes.

1. **Side strips (4) 170mm × 10mm × 10mm**
2. **Base plate 170mm × 170mm × 10mm**
3. **Jigsaw Plate (2) 150mm × 150mm**

AREAS

The surface area of a item = Width × Length.

Top surface area of side strips = **1 700 mm²**

Top surface area of base = **28 900mm²**

Top surface area of base – side strips = **27 200 mm²**

1. 170mm – 10mm – 10mm = **150 mm**
2. 90° – 45° = **45˚**
3. 90° + 90° + 90° + 90° = **360˚**
4. 170mm × 170mm = **28 900 mm²**
5. 150mm × 150mm = **22 500 mm²**

6. Once the edging has been cut, each one at **45˚** they are then glued into place using **PVA** glue and left to dry for **24** hours. For accuracy, a measurement can be taken from corner to **corner.** These should be equal. For the jigsaw, **two** plates of 10mm should be glued together but not long enough to **set**. Cut the plates on a **band saw** or use a **coping saw**. Break the cut plates apart and arrange the jigsaw. Sand clean and stain if necessary.
7. What is the surface area of the actual jigsaw without the holding tray?
   (Hint, find the area of the main block and subtract the area of the four side strips is one method)
   Answer: **22 500 mm²**

Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem, design brief, client and brainstorm	Project introduction, discussion on jigsaw design, construction and problems.	Storyboard, A4 paper. Pre made game. Example material.	English, Maths, IT (research), Graphics. Teacher observation	Collection of images of jigsaws. A4 sheet. Complete classwork.
2	Research and selection of construction, material. Look at existing products.	Isometric demo, visual blow up of construction methods. Investigate products.	A4 paper, examples of joins, puzzle alternative ideas. Game rules.	English, Maths, IT (research), Graphics and teacher observation.	Compile preferred images. Complete class work. Rough sketch of project.
3	Design ideas: Initial development of design. Final solution.	Demonstrate initial and development, Final solutions drawing.	A4 paper, Example of each joint in the construction.	Teacher observation. Graphics i.e. design.	Draw joining techniques, Complete classwork.
4	Marking out, measuring and cutting material.	Teacher demonstration of each section. Individual practical session.	Pine (type) wood, pre-cut. PVA, pencils, rules, etc.	Maths, graphical ability, quality and accuracy.	Produce a material and equipment list for lesson tasks.
5	Construction and assembly of jigsaw. Cleaning, evaluating.	Practical lesson to construct jigsaw to pre-paint or stain. Check accuracy.	Pine (type) wood, pre-cut. PVA, pencils, rules, sandpaper.	Maths, graphical ability, quality and accuracy. Visual finish.	Student self evaluate the project and compile a list of improvements.
6	Learn importance of accuracy through marking out and checking.	Trim shapes to markings, clean and fit into jigsaw board. Remove loose material.	Project boards, PVA, medium sandpaper, coping saw blades.	Maths. Graphical ability. Quality and accuracy. Visual finish.	Students self evaluate the project and compile a list of improvements.
7	Finish practical work. Evaluate project. Play with project.	Stain or paint one set of the jigsaw, final clean.	Saw, stain or paint, sandpaper.	Maths, accuracy, completion ability. Social interaction.	None, play with and enjoy the work. Take home and value the achievement.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student has completed some of the design worksheets.	The student has completed the four design brief worksheets to an aceptable standard. S/he has a good understanding of the project and has compiled some examples.	The student has completed the four design brief worksheets to a high standard. S/he has shown a good understanding of the project and has compiled several examples, pushing investigative possibilities.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student has developed some possibilities that may or may not work.	The student has developed some possibilities that may or may not work, however s/he has attempted to expand on the given project.	The student has developed many possibilities that may or may not work. However, s/he has attempted to expand on the given project.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product. S/he worked safely.	The student created the product according to the approved design and following the plans. S/he worked safely and tidily throught the unit.	The student created the product according to the approved design and following the plans. His/her work is accurate and well finished. S/he worked safely and tidy throught the unit.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student evaluated the product / solution against the design specification.	The student carried out tests to evaluate the product / solution against the design specification.	The student carried out tests to evaluate the product / solution against the design specification. S/he tried new ideas and justified choices.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provided a little evidence of personal engagement with the subject	The student provided evidence of personal engagement with the subject (general positive attitude) in technology.	The student provided evidence of personal engagement with the subject (independence, general positive attitude) in technology.

TIME FRAME AND DURATION

- 6 to 8 Weeks at 2 × 45 min lessons per week.

AREA OF INTERACTION:

- Approaches to Learning, Human Ingenuity.

INTERDISCIPLINARY, CURRICULUM LINKS WITH:

- Maths, Art.

SIGNIFICANT CONCEPTS:

- Carry out units of work in technology using materials and techniques safely and responsibly.
- Generate several feasible designs that meet the design specification.
- Follow the plan to produce the product/solution.
- Design a test to evaluate the product against the design specification.
- Work effectively as a member of a team, collaborating, acknowledging and supporting the views of others.

MYP UNIT QUESTION

- How can involving others improve the product/solution?

Sub questions:

- How can individual thinking sometimes be more effective than group discussions?
- Can group discussions be useful and, if so, why?

ASSESSMENT: STUDENTS WILL:-

- Complete the worksheets provided specifically for this project.
- Accurately mark out work using previously completed worksheets.
- Follow the stages correctly for fabrication of project, using appropriate tools and machinery.
- Develop, in duos, their individual jigsaw designs.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate, Design, Plan, Create, and Evaluate. Attitudes in Technology.

ASSESSMENT CRITERIA TO BE USED:

A, B, C, D and E, F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- Mathematic skills, for the marking out and preparation, prior to fabrication.
- English skills for the understanding of the task to be performed.
- Art experience for the ability to draw and create and develop drawings.

APPROACHES TO LEARNING:

- The unit is aimed at encouraging the students to work in pairs, to discuss as a group, as well as producing an individual project. They will become familiar (by use) of tools and equipment as well as the safety aspects involved in the workshop.

LEARNING EXPERIENCES:

- The students will initially work from the pre developed worksheets to gain an understanding of the unit. They will see finished work prior to starting to show direction. They will undergo safety instructions for the various equipment required to complete the project.
- Students will acquire knowledge by completing the various tasks. Several tasks will be open to them. All must be completed (student centred learning should take place).
- Students will work individually and 'partner up' to produce the finished product.

TEACHING STRATEGIES:

- Assessment will be based initially on the worksheets i.e. completion and presentation. Student understanding (and therefore assessment) will become more obvious once the practical work begins. Feedback on the tasks will be marked on the sheets. Verbal assessment will occur during practical and will be graded on completion of the practical.
- The project is aimed at student centred learning. Whereby the student is aware of what is required and manages the tasks to suit availability of equipment and stages needed.
- The project has huge scope for differentiation as in the starting point or the stages (can be adjusted) required by the teacher.
- This is a highly visual project and students with language difficulties and, to some extent, learning difficulties can follow the step by step pictorial guide in the booklet.

RESOURCES:

The project will be based solely in the DT room to allow students to become more familiar in the workshop. General hand tools should be accessible.

OCCASIONAL TABLE

A more advanced project for late junior years to early senior. Enjoyable to pupils, fairly gentle on the departmental budget. A directed project, although it has huge potential for development through variation.

Points of interest

- Easy and enjoyable to make.
- Students can use the finished job.
- Cross curricular with maths and graphics.
- Assessment on accuracy and finish.
- No variation for whole class.
- Project for later intermediate to senior pupils.

Experience of the workshop. Occasional Table project basic skills.

- Workshop safety
- Hand tool safety
- Material selection
- Wood as a medium
- Importance of accuracy
- Finishing a project

This project is aimed at students who know workshop practices and are competent using the various allowed machines. It can be as basic as the picture shows or more elaborate as shown in later pictures.

It is a larger project, hence harder than others in this series on the department budget. However, the practical and research time scale should be considerably longer. If the research and development lessons are expanded, this project can cover almost the entire year.

Each table can use as little as 2.5m of 150mm × 20mm pine.

Flexibility on the table is huge, therefore the project is ideal for differentiation across the class.

Students enjoy this project because of its ease of construction and multiple possibilities for enhancement on the basic design.

Points to Look out for

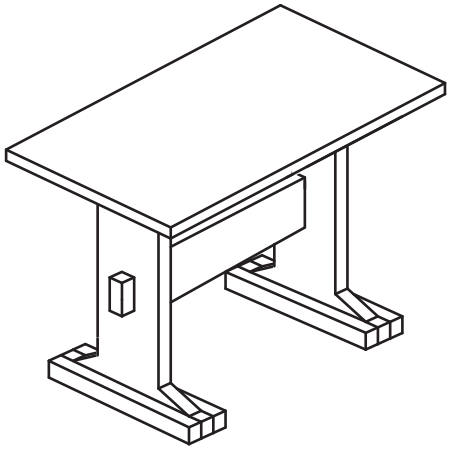
Some students may try to make freehand measurements.

Accuracy is vital for a successful project.

Occasionally, students try to chisel out the slots in the legs. This will split the wood.

Over-cleaning with sandpaper will cause a loose-fitting job.

Split work can be glued and used if left to dry.



STARTING WITH THE CUTTING LIST

3 off 420mm × 150mm × 20mm (Pine)	Legs and Cross brace.
2 off 500mm × 150mm × 20mm (Pine)	Table Top
4 off 250mm × 50mm × 20mm (Pine)	Feet Sides
4 off 50mm × 50mm × 20mm (Pine)	Feet Centres
2 off 30mm × 150mm × 20mm (Pine)	Leg to Top fixing strip
2 off 60mm (10mm dowel)	Brace, Leg, Bar.

Consumable Materials: PVA Glue, Panel Pins (optional), Sandpaper, Stain, lid material (variations).

■ STEP 1 MARKING OUT AND CUTTING THE LEGS.

Fig 1

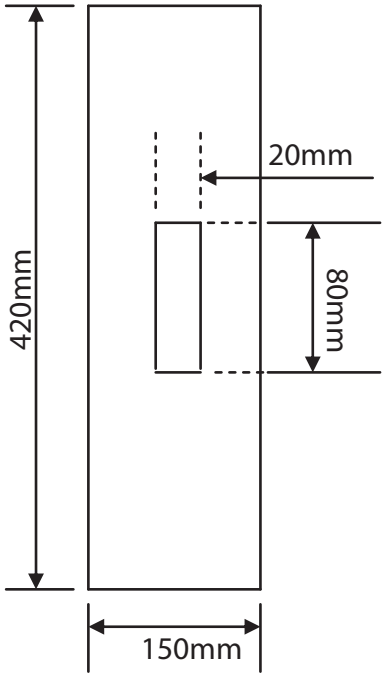
Take one sheet of A4 paper, cut to fit leg size, 420mm-150mm.

Fold the paper in half and draw one side of the leg pattern. Cut the paper template out.

Tape the paper template and both legs together (see fig 1).

Pine is an ideal wood for this project. Do try to avoid knots in awkward areas such as cutting lines or stress points.

After cutting the shape of the legs, the paper template is of no further use. However it may be kept for folio purposes.



Measurements for centre slot

Fig 2: Mortice cutting

It is better to mortice out the centre while the legs are in straight sections. see fig 2.

The legs (both) can now be cut to the shape of the paper template. Carefully cut curves on the band saw. (see fig 3).

Fig 3

Mortice inside the lines to keep a tight fit.

Do not make tight turns on the bandsaw as the blade will twist and may break.

At this stage it is a good idea to clean the band saw marks from both legs (using a half round file and sandpaper). This is a little time consuming but it is better to do it while the legs are free to move and flip rather than later when the table is assembled.

The central slots are vital to the easy construction and look of the finished project.

Keep them as tight as possible.

When the legs are cleaned they can now be split apart. If desired they can be routed for a more interesting design. Do not router the bottom of the legs as they will have feet attached. It is also good practice at this stage to ensure the centre slots are clean and no more than 20mm by 80mm.

STEP 2 MAKING AND ATTACHING THE FEET

Pieces for the feet

The feet are made from four strips. The lengths of the outer strips can vary depending on the design. However they should not exceed the width of the table top (300mm).

Glued pieces for the feet

Build the feet around the base of the leg, glue and clamp. Remove the leg and leave to dry.

Feet removed from leg

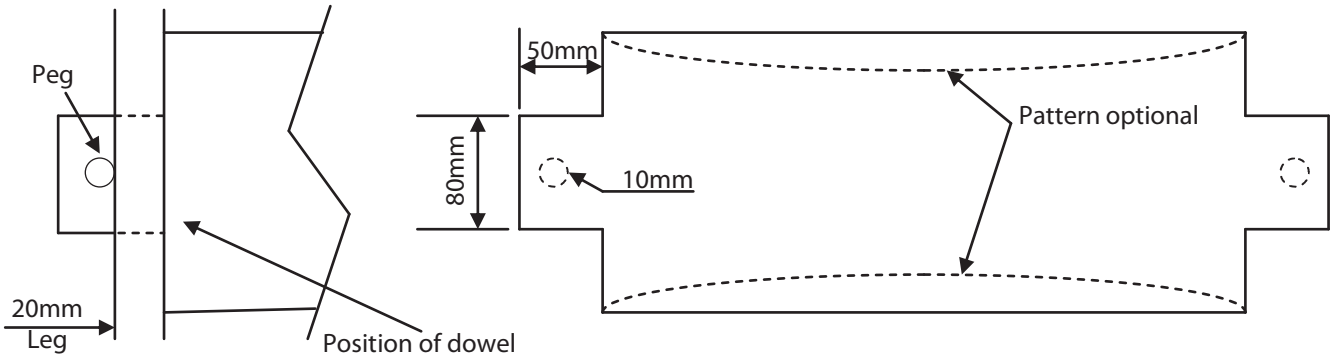
The foot can now be cut on a band saw into any shape or style desired. Sand and clean.
NOTE: It may be better to leave the foot off until final construction to assist in any final leveling of the table.

Cut and finished feet

The centre strut is cut the same size as the two legs. Each end is shaped to fit into the two slots made in the legs. The pattern should match the style of the legs.

Again, clean this piece before construction of the table. Be careful not to thin the wood so it will be loose in the leg slots.

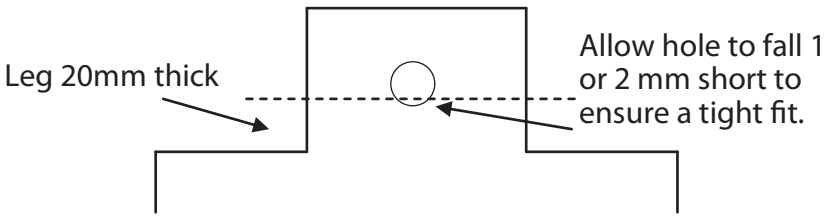
Uncut centre strut



STEP 3 FIXING THE CENTRE STRUT.

When drilling hole for the dowels, measure the correct centre and deduct 1 or 2 mm to make the two legs pull to a tight fit and reduce movement.

Peg for fixing centre brace



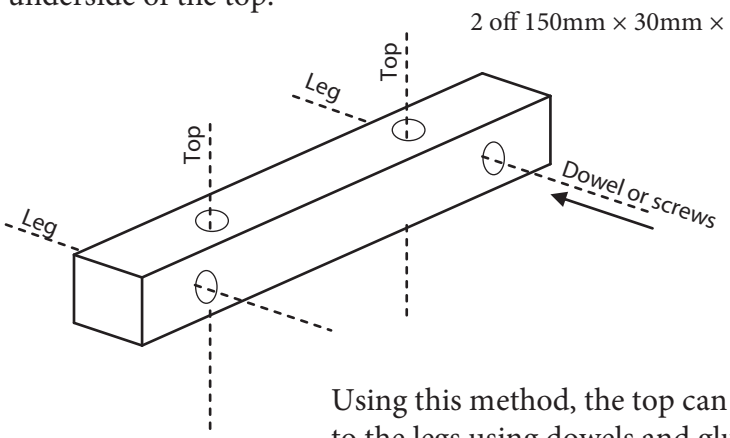
Note

The entire table can be assembled without the use of screws or nails.

STEP 4 FITTING THE TOP

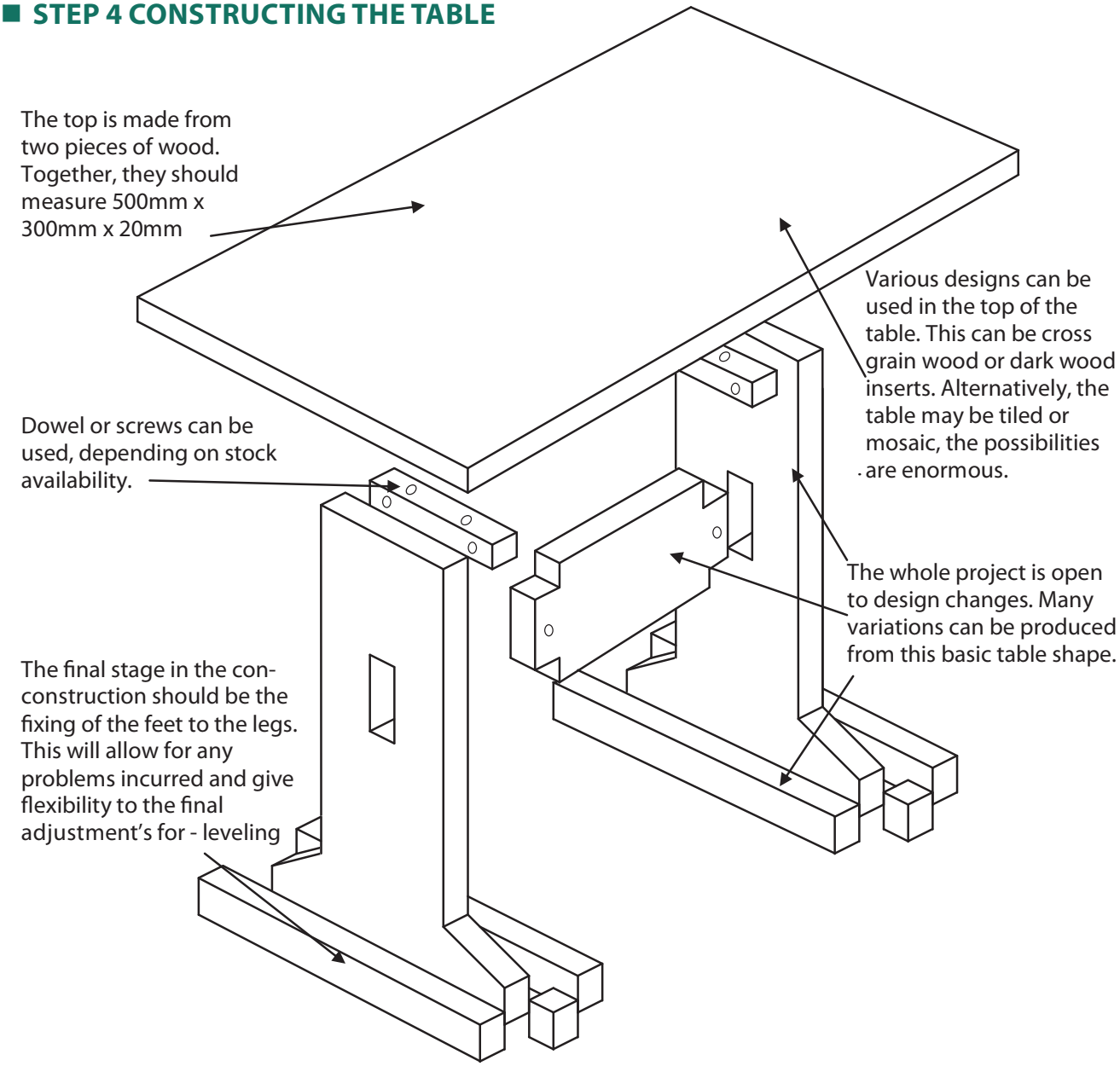
Strip for fixing leg to top

Care must be taken when drilling the underside of the top.



Using this method, the top can be fixed to the legs using dowels and glue. 10mm dowel will make a sturdy connection.

STEP 4 CONSTRUCTING THE TABLE



Apart from the feet, it is possible to make the table entirely without glue.

However, the feet can be made from a solid block.

The basic table is shown above. The table on the right has a wider top, two struts across the middle and aluminum bars to give a magazine rack. Also, the student has given more time to the finish of the end product.

WORKSHEET 1 NAME:_____

Draw a rectangle 80mm × 20mm in the centre of the larger rectangle at right:.

Some useful calculations for making the table.

150mm ÷ 2 = _____

80mm ÷ 2 = _____

75mm – 40mm = _____

40mm + 40mm = _____

420mm ÷ 2 = _____

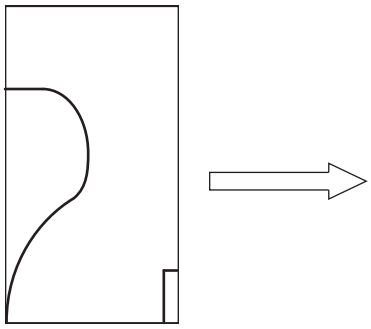
150mm – 80mm = _____

120mm ÷ 2 = _____

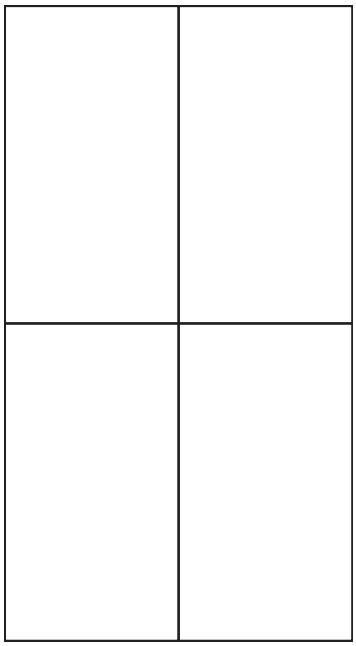
Name five uses for a table this size.

1. _____
2. _____
3. _____
4. _____
5. _____

6.

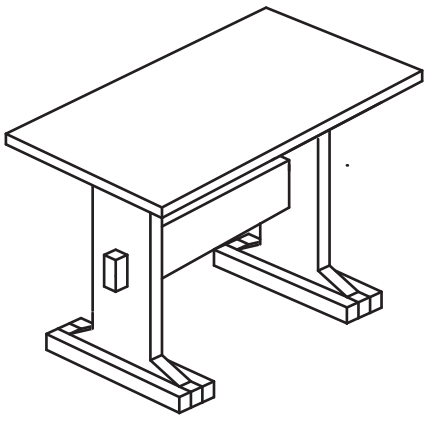


A sheet of paper cut to size (420mm × 150mm) and folded into four.
The shapes shown are drawn onto the top sheet and cut out.



Draw the shape as it appears when the paper is unfolded.

7. Shade three parts of the table you may change in your design.



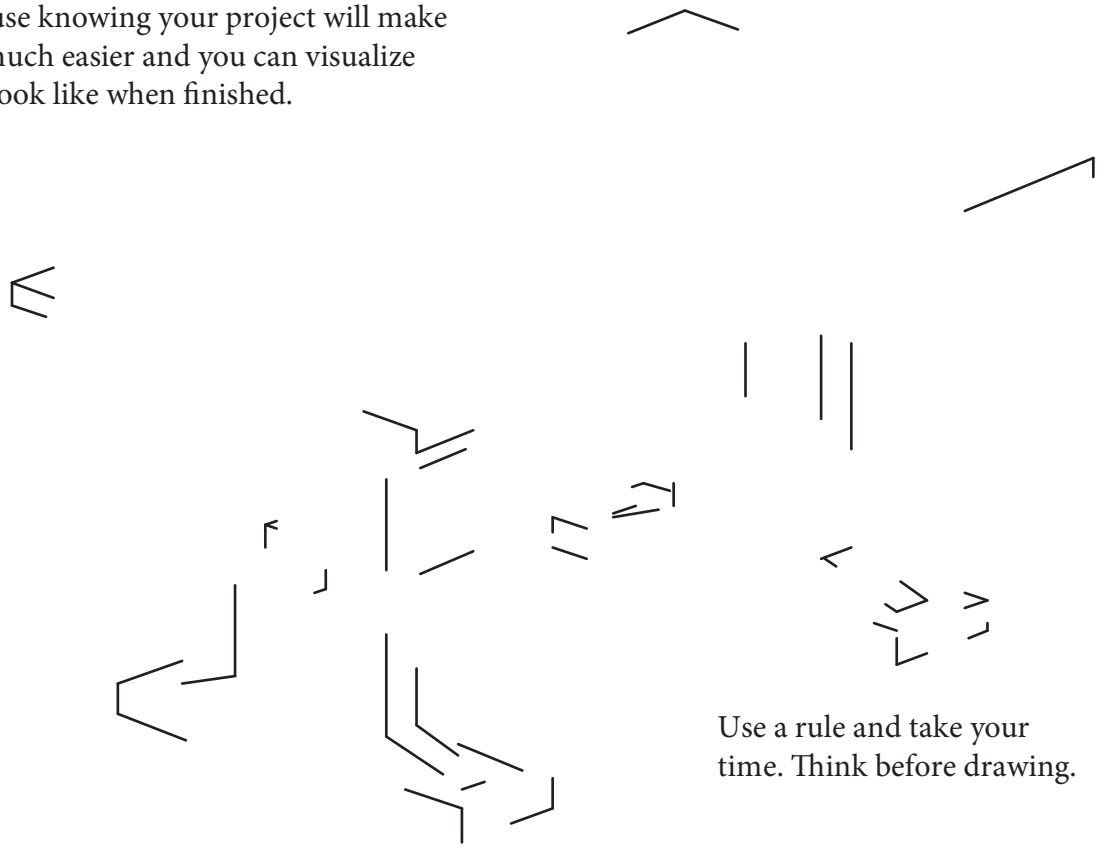
Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 2

NAME:_____

Complete the drawing below.

Why ? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished.



Use a rule and take your time. Think before drawing.

1. What is the definition of a hard wood ? _____

_____

2. What is the definition of a soft wood ? _____

_____

3. Name three hard woods _____

_____

4. Name three soft woods _____

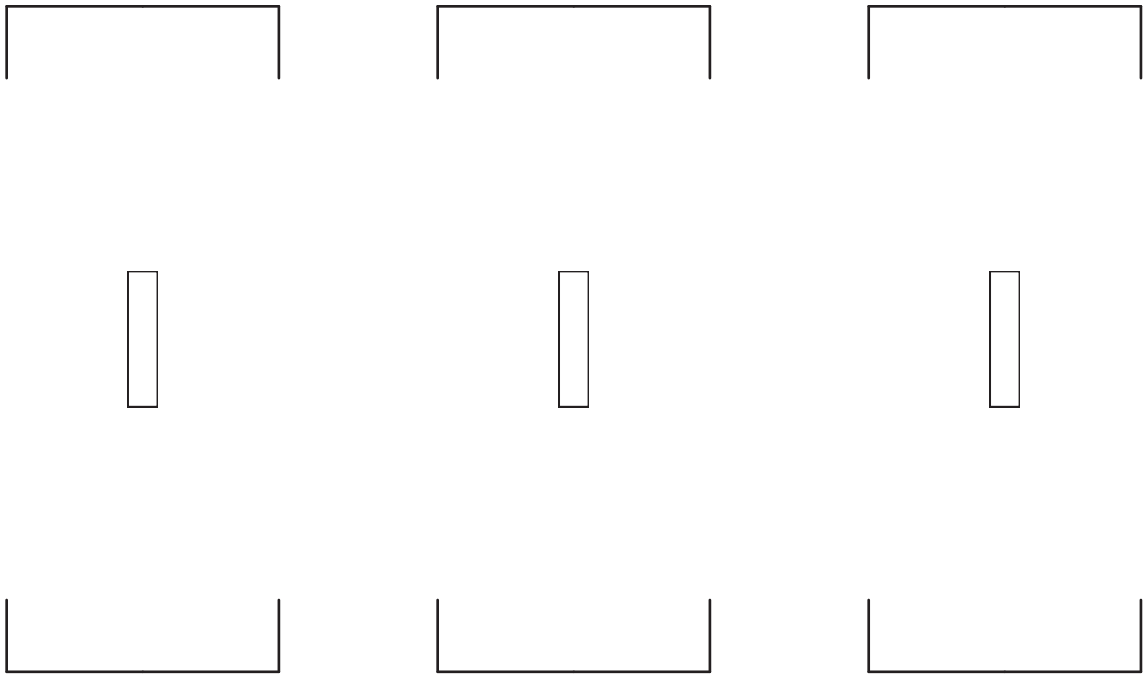
_____

5. What is a mortise drill used for ? _____

_____

6. Draw a tenon saw.

7. Draw 3 three different styles of table legs.



8. Mark out below two possible table tops, explain your choice and materials.

Grade yourself 1 to 6: ☐

Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 3 NAME:_____

Evaluation (This is an important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could be better?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

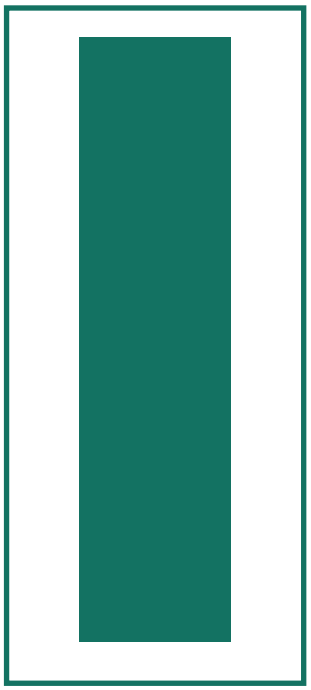
_____

Free hand sketch a 3D drawing of your table.

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 1 ANSWERS

Draw a rectangle 80mm × 20mm in the centre of the larger rectangle at right:.



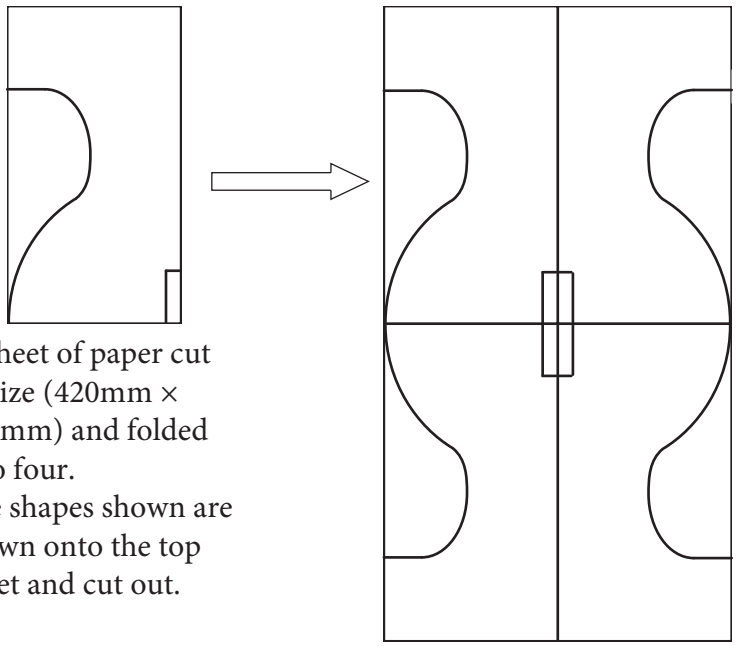
Some useful calculations for making the table.

150mm ÷ 2	= **75mm**
80mm ÷ 2	= **40mm**
75mm – 40mm	= **35mm**
40mm + 40mm	= **80mm**
420mm ÷ 2	= **210mm**
150mm - 80mm	= **70mm**
120mm ÷ 2	= **60mm**

Name five uses for a table this size.

1. **Many answers possible: dining, working, display etc.**
2. _____
3. _____
4. _____
5. _____

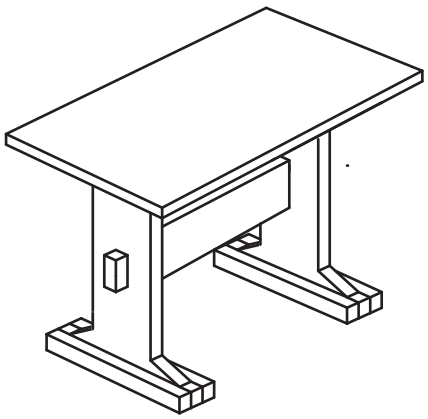
6.



A sheet of paper cut to size (420mm × 150mm) and folded into four.
The shapes shown are drawn onto the top sheet and cut out.

Draw the shape as it appears when the paper is unfolded.

7. Shade three parts of the table you may change in your design.



Several answers: top, feet, legs etc.

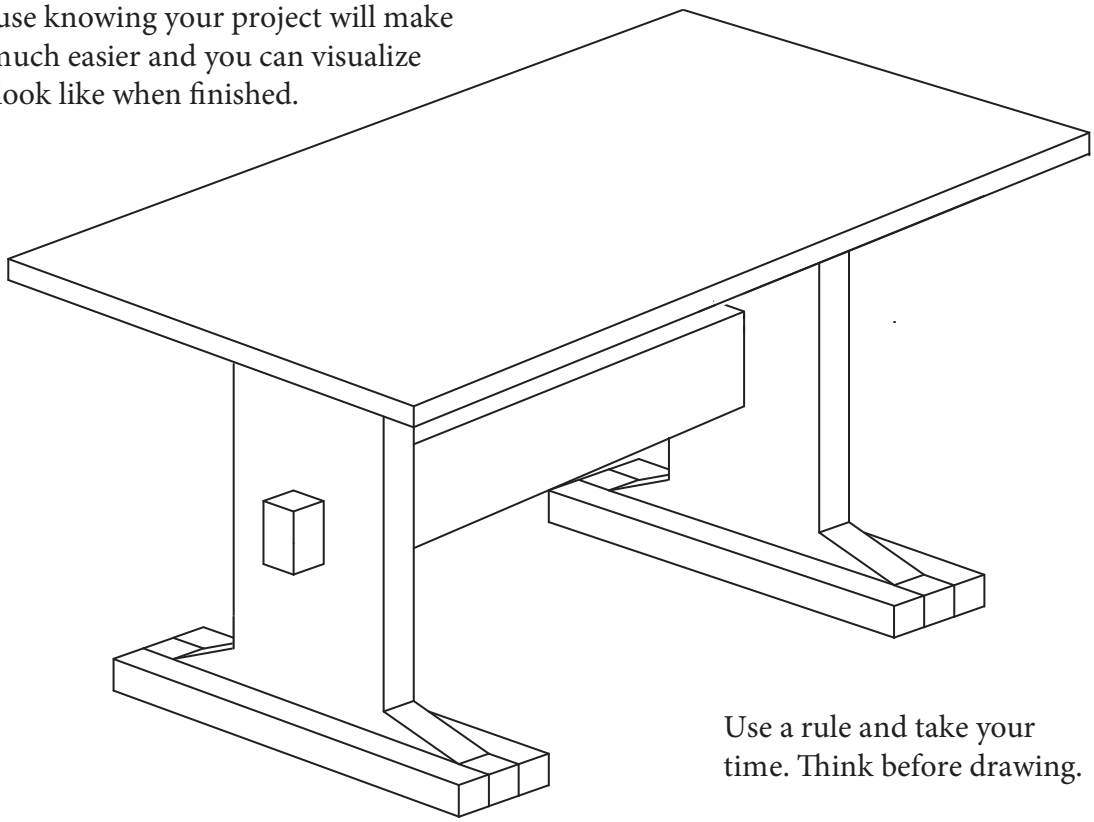
Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 2

ANSWERS

Complete the drawing below.

Why ? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished.



Use a rule and take your time. Think before drawing.

1. What is the definition of a hard wood ? (The answers should include any of the following words).

   Broad Leaved, mostly deciduous, angiosperm , dense grain, lose their leaves in autumn.

2. What is the definition of a soft wood ?

   Needle-bearing, conifer, evergreen, long length fibers, cone bearing.

3. Name three hard woods

   e.g. Maple, Oak, Ash, Elm, Beech, Mahogany.

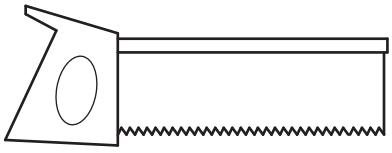
4. Name three soft woods

   e.g. Spruce, Cedar, Pine, Larch, Cypress, Fir, Redwood, Yew.

5. What is a mortise drill used for ?

   Cutting square holes.

6. Draw a tenon saw.



Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem, design brief, client and brainstorm.	Project introduction, discussion on table design, construction and problems.	Storyboard, A4 paper. Pre made table. Example materials.	English, Maths, IT (research), Graphics. Teacher observation.	Collection of images of small tables. Complete classwork.
2	Research and selection of construction, material. Look at existing products.	Isometric demo, visual blow up of joining methods. Investigate products.	A4 paper, examples of joins. Alternative table ideas. Table styles.	English, Maths, IT (research), Graphics and teacher observation.	Compile preferred images. Complete class work. Rough sketch of project.
3	Design ideas: initial development of design final solution	Initial demonstration and development, Final solutions drawing.	A4 paper, Example of each joint in the construction.	Teacher observation. Graphics i.e. design	Draw joining techniques, Complete class work.
4	Marking out wood, using correct measurements and cutting material.	Teacher demonstration of each section. Individual practical session..	Pine (type) wood (no knots), pre cut. PVA, pencils, rules, etc.	Maths. Graphical ability. Quality and accuracy. Teacher observation.	Produce a material and equipment list used for lesson tasks.
5	Student practical ⇓	Student practical ⇓	Workshop ⇓	Teacher observation ⇓	None ⇓
4	Construction and final assembly of table. Cleaning, evaluating.	Practical lesson to construct table to pre-varnish or stain. Check stability..	Pine (type) wood (no knots), pre cut. PVA, pencils, rules, sandpaper etc.	Maths. Graphical ability. Quality and accuracy. Visual finish.	Student self evaluate the project, list of improvements.
5	Learn importance of accuracy through marking out and checking.	Clean table. Remove loose material.	Project boards, PVA, sandpaper, pencils, rules, A3 paper.	Maths. Graphical ability. Quality and accuracy. Visual finish.	Students self evaluate the project and compile a list of improvements.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student has not developed on the given design brief.	The student has developed on the given design brief. S/he has identified a range of appropriate information.	The student has developed on the given design brief. S/he have identified and acknowledged a range of appropriate information.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student follows the given plans with little or no adaptation.	The student has understood the project and enhanced the design to suit his/her own ideas.	The student has clearly visualized the given project and adapted the criteria to suit his/her own individual design ideas.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student has followed the given scheme.	The student has generated two acceptable designs that meet the specification.	The student has generated several feasible designs that meet the specification and justifies his/her final choice.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product according to the given design, working safely through the unit.	The student created the product according to his/her individual design. S/he has completed the table to a reasonable standard. Working safely through the unit.	The student created the product according to his/her individual design. S/he has completed the table to a high quality, working safely.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student evaluated his/her use of the design cycle.	The student evaluated his/her use of the design cycle, and suggests how his/her performance could be improved.	The student evaluated his/her use of the design cycle. S/he evaluated his/her performance at each stage and suggested how it could be improved.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provided some evidence of personal engagement with the subject.	The student provided evidence of personal engagement with the subject ie - motivation, positive attitude.	The student provided evidence of personal engagement with the subject i.e. - motivation, positive attitude and independence.

TIME FRAME AND DURATION

- 7 to 9 Weeks at 2×60 min lessons per week.

AREA OF INTERACTION:

- A,t,L, Human Ingenuity, Environment.

INTERDISCIPLINARY, CURRICULUM LINKS WITH:

- Maths, Graphics, Humanities.

SIGNIFICANT CONCEPTS:

- Collect, analyse, select, organize and evaluate information.
- List the specific requirements that must be met by production.
- Generate several feasible designs that meet the design specification.
- Ensure a safe working environment for themselves and others.
- Select one design and justify the choice.
- Follow the plan to produce the product/solution.
- Explain how the product/solution could be improved.
- Provide evidence of personal engagement with the subject (motivation, independence, general positive attitude) when working in technology.

MYP UNIT QUESTION

- What process do we use to utilize/change a given product and enhance the design for a client/personal use?

Sub questions:

- Have we used the design cycle?

ASSESSMENT: STUDENTS WILL:

- Complete the worksheets provided specifically for this project.
- Complete in no less than 1000 words, the material used and the impact of these materials to the environment.
- Produce A4 dimensioned third angle and Isometric drawing of the project.
- Design several alternatives for the legs and top of the table.

- Justify how to make and why the final design was chosen.
- Ensure a safe working environment at all times.
- Evaluate the work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate Design, Plan, Create, Evaluate, ATL.

ASSESSMENT CRITERIA TO BE USED:

A, B, C, D, E and F

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- Mathematics skills, for the marking out and preparation prior to fabrication.
- Basic hand, machine and previous workshop experience is desirable for fabrication of project. Isometric drawing and third angle experience is desirable.

APPROACHES TO LEARNING:

- The unit is aimed to take the students into understanding the complete design cycle. Strong emphasis is placed on "Student Centreed Learning" as they should already hold a basic knowledge of hand and machine tools.

LEARNING EXPERIENCES:

- The students should be able to construct mid level third angle sketches, internationally recognizable in construction.
- After completing the pre developed worksheets and gaining an understanding of the unit. The student should be able to individually design and evaluate their work and begin on the practical part of the unit.
- Students will have acquired knowledge by completing the various tasks.
- It is expected or presumed that students have prior knowledge of the subject gained in previous units before beginning this project.

TEACHING STRATEGIES:

- The project has huge scope for differentiation as in the starting point or the stages (can easily be adjusted) as required by the teacher.
- This is a highly visual project and students with language difficulties and to some extent learning difficulties can follow the step by step pictorial guide in the booklet.
- The project is aimed at student centred learning. Whereby the student is aware of what is required and manages the tasks to suit availability of equipment and stages needed.
- Assessment will be based on the finished practical written work and submitted third angle, Isometric drawing. Student understanding (and therefore assessment) will become obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and also verbal during practical.

STORAGE BOX

An ideal starting project.

Points of interest

- Standardized construction for the whole class .
- Variations on finish.
- Easy project storage.
- Assessment on accuracy and finish.
- Limited variation for whole class.
- Storage box project intermediate skills.

Experience of the workshop. Storage Box project basic skills.

- Workshop safety
- Machine safety
- Material selection
- Wood as a medium
- Importance of accuracy
- Finishing a project

This project, when finished, can have a multitude of purposes. The lid designs can vary from plain to intricate, all depending on the ability of the student and the function of the box. The basic construction of the box is standardised throughout the class, thereby keeping variation and teaching consistent with the group. For lower or intermediate students, the basic construction of the box may incorporate lap joints. For higher ability students finger or dovetail joints can give a better appearance as well as being stronger. The moulding can be easily made by routing both sides of a 20mm by 150mm plank then cutting it into strips. This is a huge saving on the budget and makes student mistakes almost irrelevant.

Points to Look out for

Accuracy on lap joints is very important.

Make sure the basic box is accurately square.

Allow the glue to dry on corners before fitting top and bottom.

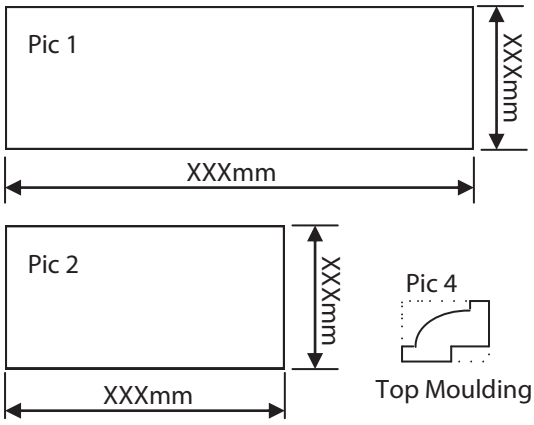
Moulding for top and base should differ.

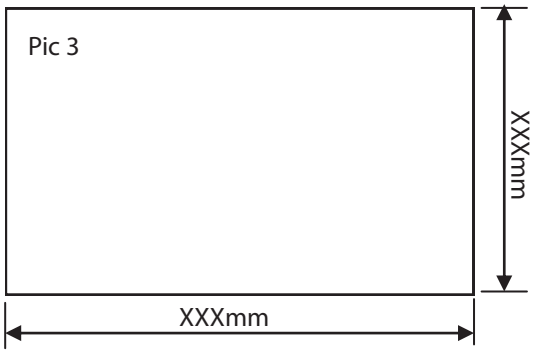
Mouldings can be made in workshop.

Allow students to vary the on-top finish.

STARTING WITH THE CUTTING LIST

2 of 150mm × 100mm × 20mm (Pine)	See pic 1	Box Length panels.
2 of 100mm × 25mm × 5mm (Pine)	See pic 2	Box width panels.
2 of 150mm × 100mm × 6mm (MDF)	See pic 3	Plywood for top and base.
1 of 10mm × 30mm Molded beading (Top)	See pic 4	
1 of xxmm × xxmm Molded beading (base)	See pic 5	





To save cost, the moulding can be made in the workshop.
Pic 5

Base Molding

Consumable Materials: PVA Glue, Panel Pins (optional), Sandpaper, Stain, lid material (variations).

Step 1 Basic box construction.

Four cut pieces for box

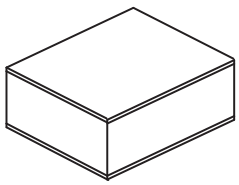
Lap joints will be strong enough although, for variations and extensions, finger joints may suit the class better.

Glued box carcass

Step 2: Fixing top and base, splitting box.

Basic box

The top and base should be glued. Panel pins can be used if necessary.



SEPARATING THE LID FROM THE BASE IS THE CRITICAL POINT OF THE PROJECT AS THE CUT MUST BE ACCURATE.

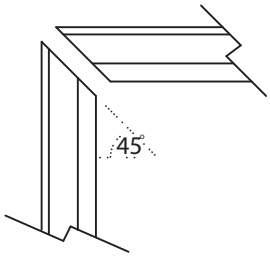
Separated lid and base

The split can be made with a band saw although a circular saw gives a straighter cut.

Step 3 Fitting the beading

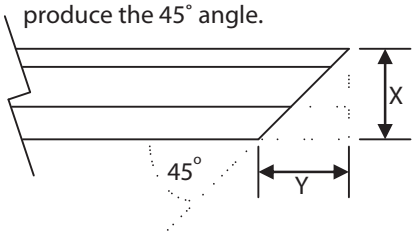
Fitting the mitred beading

Make sure that all mitred joints fit accurately before glueing. Once glued, the four pieces can be held in place with masking tape until the glue has dried.



Don't use panel pins on moulding as it will split the wood

Measure the width (X), transfer this measurement to (Y), draw a line and this will produce the 45° angle.



Step 4 Hinges, sealing lid, cleaning.

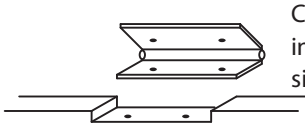
Box with moulding

Wood can sometimes be a difficult surface to attach other materials to.

Sand all marks and excess glue from project. Mix a small amount of glue and water (60% pva/40% water). Paint evenly into the lid recess. This will give a good dust free surface to bond with whatever inlay is chosen for the final finish.

Hinges and latches can be bought from any reasonable hardware store. Size and style is dependent on the teacher or individual student.

Add PVA glue to the mitred corners of the moulding, then give a light sanding around the beading. This will help hide small gaps, saw marks etc.



Cut two notches in the rear to sink hinges.

Two hinges per box

Hinges and a locking latch

Open Box

Internally, the box can be stained, lined with cloth or compartments can be added.

The inlay in this instance utilizes the recess in the lid. A simple pattern of broken tiles is used in a mosaic style.

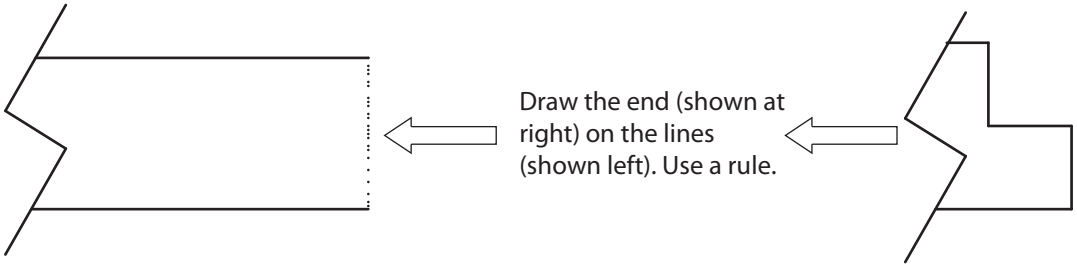
Other design ideas could involve various other materials, e.g. veneers, resin, glass or even cloth. The lid design may symbolize what use the box will have.

Tiled lid finish

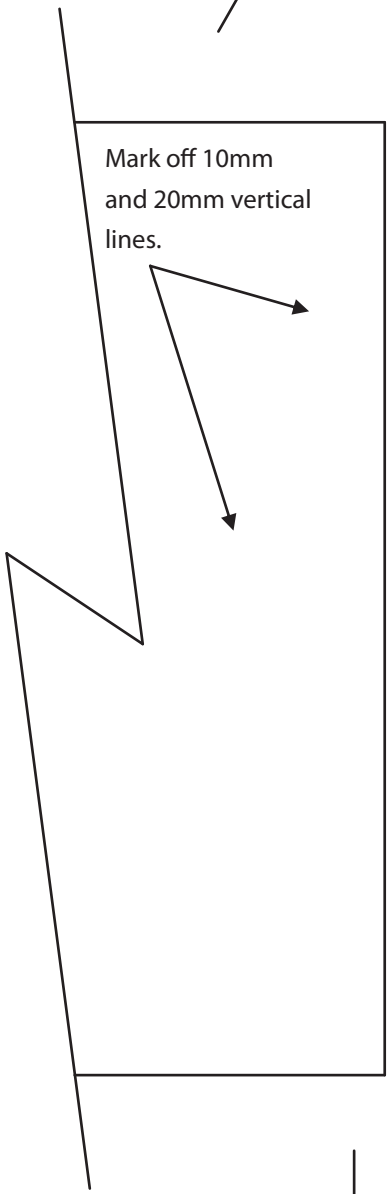
WORKSHEET 1

NAME:_____

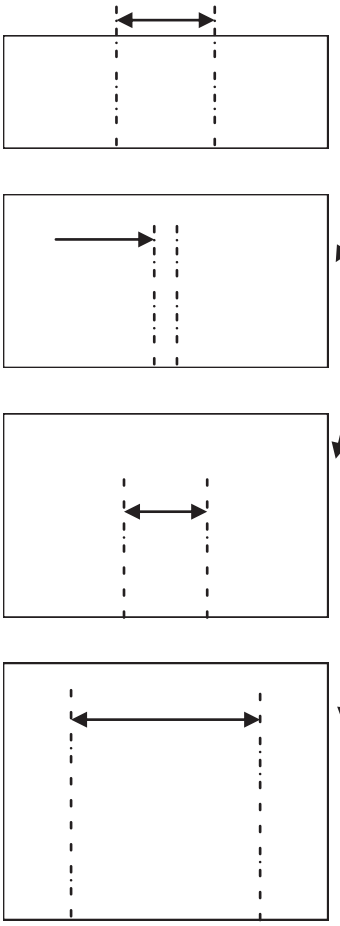
Work on this page with your teacher.



Draw the end (shown at right) on the lines (shown left). Use a rule.



Mark off 10mm and 20mm vertical lines.



Mark off each of the boxes to 45° and measure the part remaining in the centre.

Sketch a top moulding in the box below.

Sketch a base moulding in the box below.

Teacher comment:

Bisect the 90° into two 45° angles using compasses.

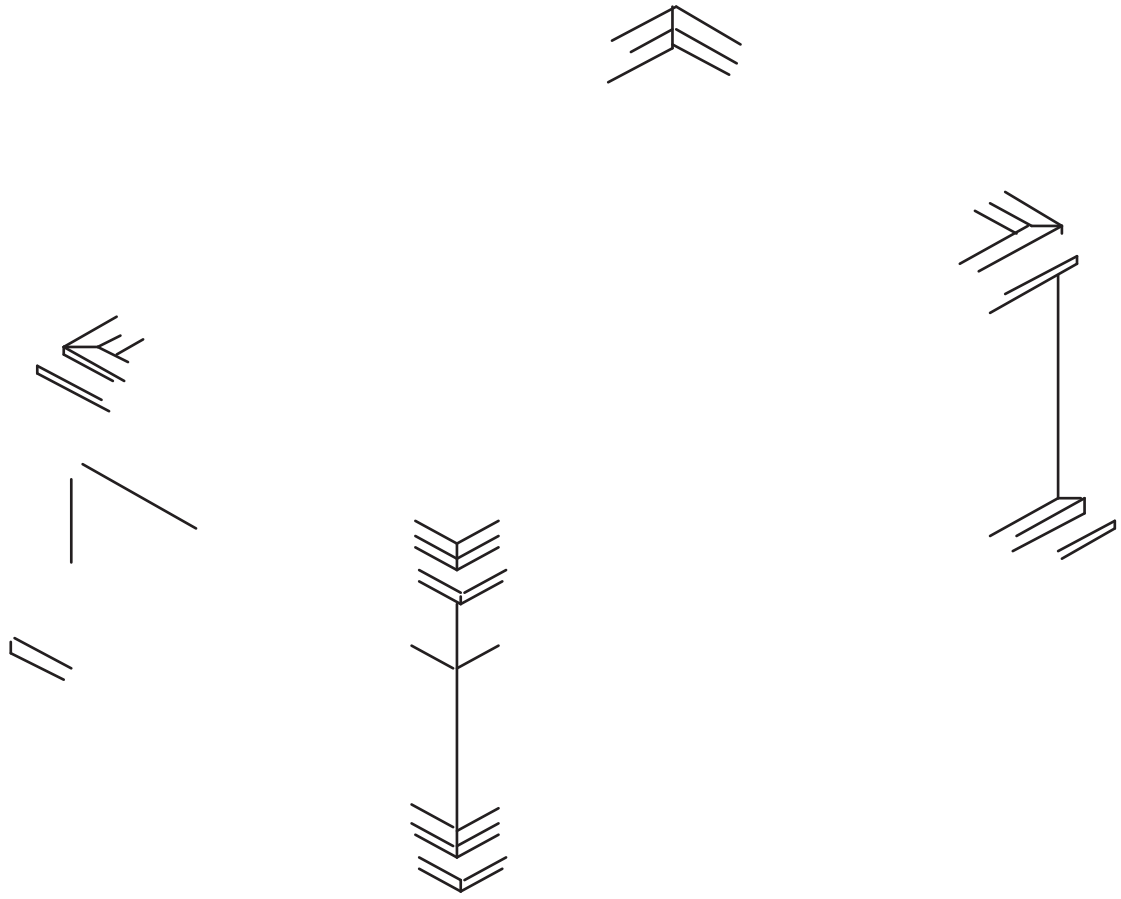
Grade:

MYP Design & Technology

WORKSHEET 2 NAME:_____

Complete the drawing below.

Why? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished. Use a rule and take your time. Think before drawing.



1. Name the type of wood used in the project. _____
2. Choose wood for the lap joints without _____
3. Always sand across the grain of the wood. True/False
4. What is the name of the saw used when you cut for the lap joint ?_____
5. What do you use to check that the box is square? _____
6. The moulding should be cut at what angle? _____
7. Split pieces can be glued although must be allowed to set for _____ hours.

8. The material used for the lid and base is called _____.

9. What should be avoided when cleaning the pieces? _____

_____

10. This project is a test of _____

Evaluation (This is a important stage of learning and understanding)

If you could start again, what would you do differently? What went wrong in the making?

What could you have done better?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

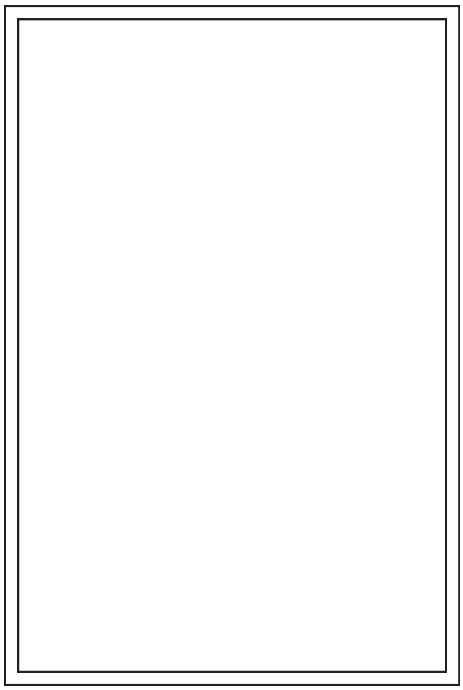
_____

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

WORKSHEET 3 NAME:_____

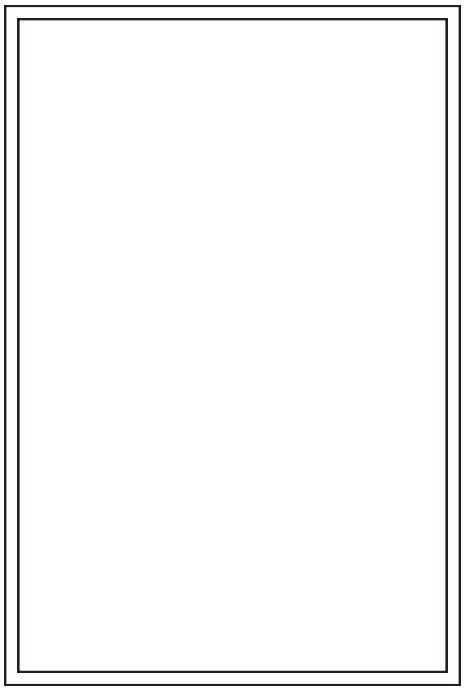
Design four possibilities for the insert on the top of your box. Give a brief explanation of each and the materials chosen.

1



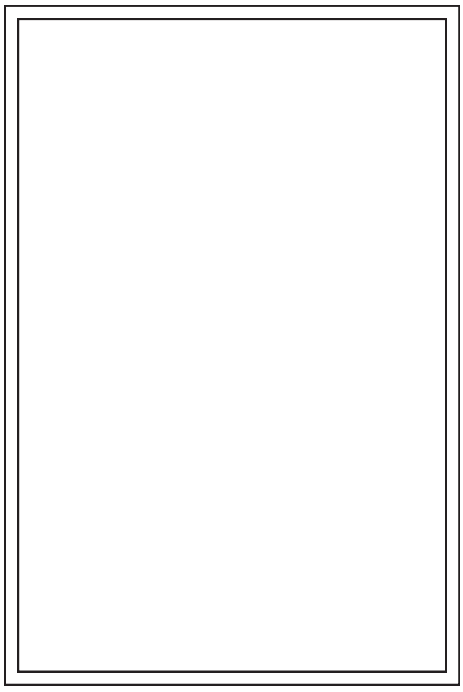
Material Used in 1 —

2



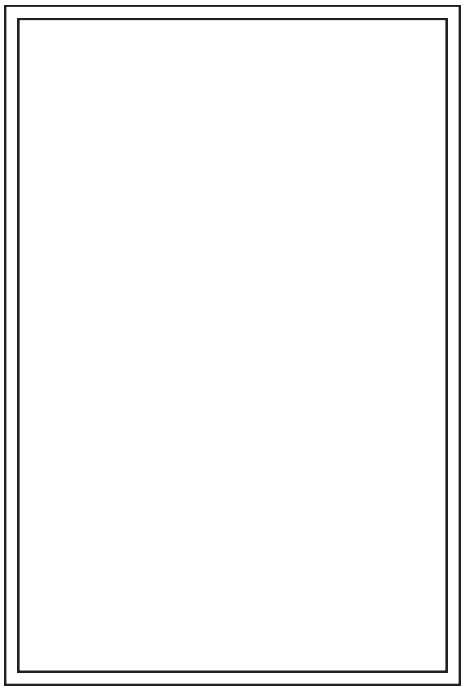
Material Used in 2 —

3



Material Used in 3 —

4



Material Used in 4 —

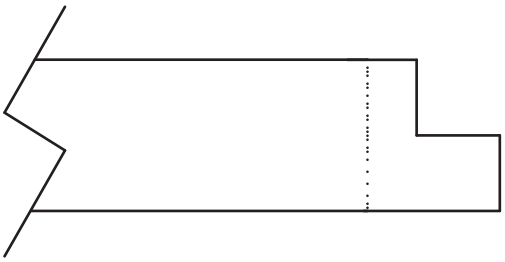
Grade yourself 1 to 6: ☐

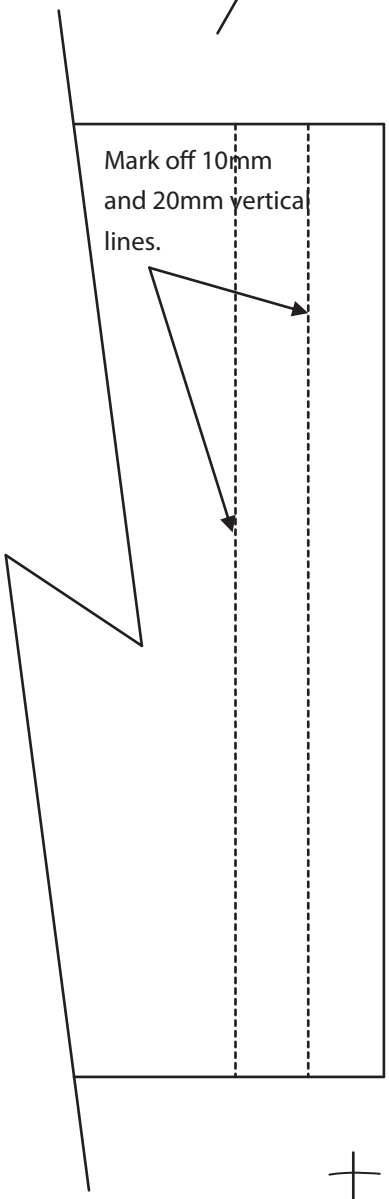
Teacher grade 1 to 6: ☐ (with 6 highest)

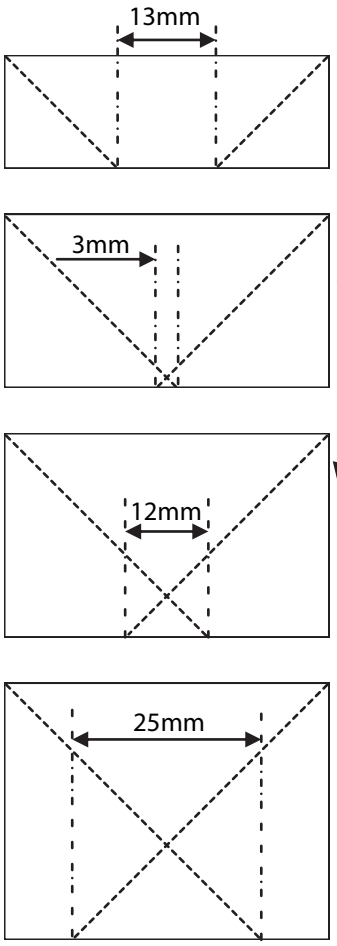
WORKSHEET 1

ANSWERS

Work on this page with your teacher.

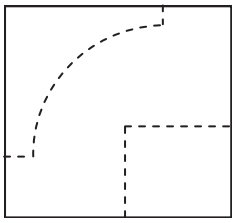




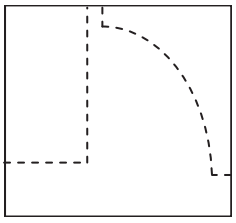


Mark off each of the boxes to 45° and measure the part remaining in the centre.

Sketch a top moulding in the box below.

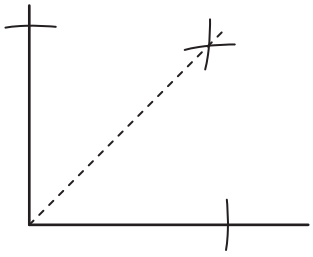


Sketch a base moulding in the box below.



Teacher comment:

Bisect the 90° into two 45° angles using compasses.

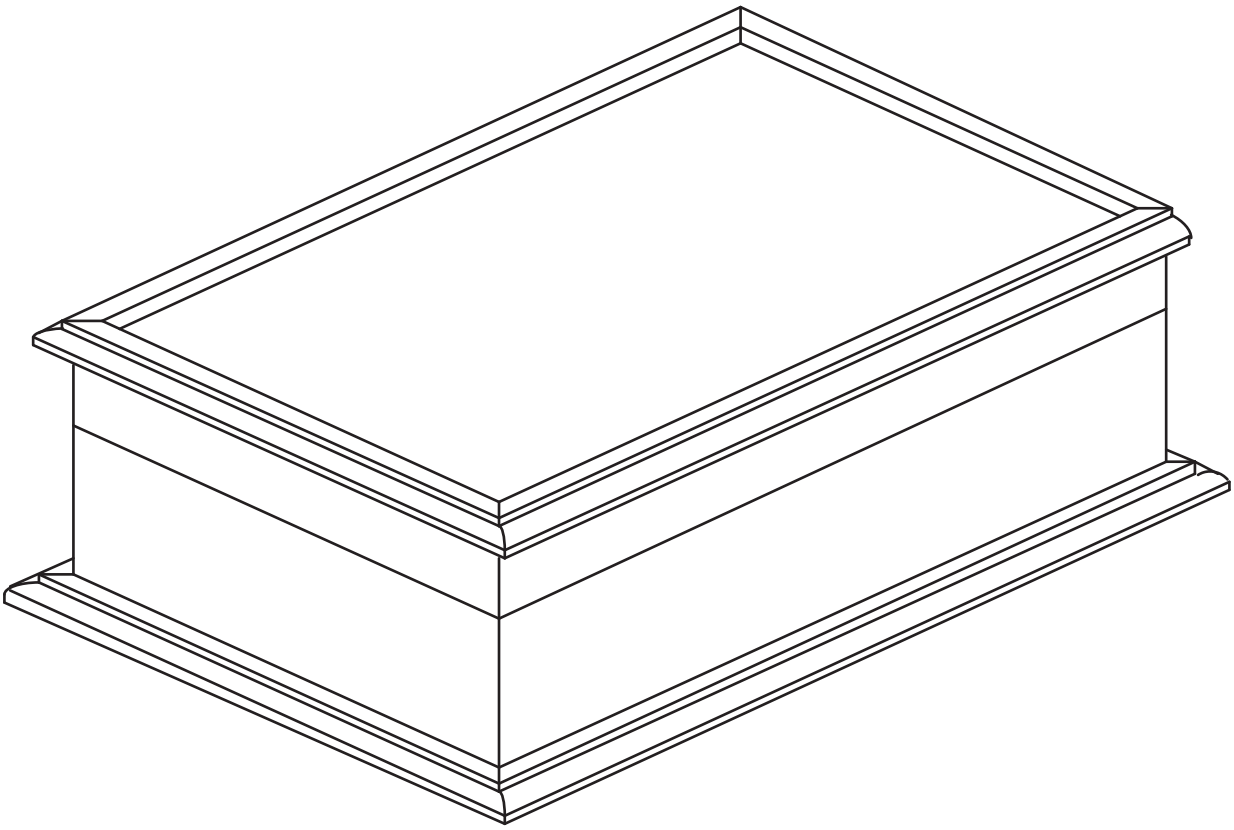


Grade:

WORKSHEET 2 ANSWERS

Complete the drawing below.

Why? Because knowing your project will make the task so much easier and you can visualize what it will look like when finished. Use a rule and take your time. Think before drawing.



1. Name the type of wood used in the project. **Body Pine, MDF or Plywood top, base.**
2. Choose wood for the lap joints without **knots.**
3. Always sand across the grain of the wood. **False.**
4. What is the name of the saw used when you cut for the lap joint ? **Tenon Saw.**
5. What do you use to check that the box is square? 90˚ **Set Square.**
6. The moulding should be cut at what angle? **45˚.**
7. Split pieces can be glued although must be allowed to set for **24 hours.**

8. The material used for the lid and base is called **MDF (Plywood can be used).**

9. What should be avoided when cleaning the pieces?**Excess Glue.**

10. This project is a test of - Ability to follow plans, **Use of design cycle.**

Evaluation (This is a important stage of learning and understanding).

If you could start again, what would you do differently? What went wrong in the making?

What could you have done better?

Grade yourself 1 to 6: ☐ Teacher grade 1 to 6: ☐ (with 6 highest)

Scheme of work

The Scheme of work may look something like this:

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
1	Analyzing the task, problem design brief, client and brainstorm	Project introduction, discussion, on box design, construction and problems.	Storyboard, A4 paper. Pre-made joints. Exemplar tops.	English, Maths, IT (research), Graphics. Teacher observation.	Collection of images of joints. Possible lid designs. Complete class work.
2	Research of construction, material selection, and joints.	Isometric demonstration, blow up of joints. Investigate box products.	A4 paper, examples of joins, alternative ideas.	English, Maths, IT (research), Graphics.	Compile preferred images and lid designs.
3	Design ideas. Initial development of design final solution	Demonstrate initial idea and development of final solution drawing.	A4 paper, example of each joint in the construction.	Graphics i.e. design and development. Research.	Draw joining techniques. Complete classwork.
4	Marking out, measuring and cutting material.	Teacher demonstration of each section. Individual practical session.	Pine (type) wood, pre-cut. PVA, pencils, rules, etc.	Maths, graphical ability, quality and accuracy.	Produce a material and equipment list for lesson tasks.
5	Construction and assembly of box carcass. Square, evaluation.	Practical lesson to construct box carcass. Lap joints. Square and leave to set.	Pine (type) wood, pre-cut. PVA, pencils, rules, set square, tools.	Maths, graphical ability, quality and accuracy. Safety procedures.	Student to self evaluate the project and compile a list of skills gained.
6	Learn importance of accuracy through marking out and checking.	Cut and chisel to markings Clean and fit sides to construct shape for base.	Project boards, PVA, sandpaper, panel pins. Pencil, set square.	Maths, graphical ability, quality and accuracy. Use of tools.	Students self evaluate the project and compile a list of improvements.
7	Step by step project advancement. Finishing in stages not rushing.	Fit top and base to box using panel pins and PVA glue. Clean rough edges.	Panel pins, file, sandpaper, pencil, rules, clamps, square.	Maths, graphical ability, quality and accuracy. Use of tools.	Students self evaluate the project and compile a list of improvements.

Lesson	Lesson Objectives	Activities	Materials	Assessment Cross-curricular	Homework
8	Finish construction and the importance of cleaning before adding stain.	Cut lid, fit hinges and moulding to lid and base. Clean up project and sand.	Hinges, screws, PVA, stain, sandpaper, materials for lid design.	Maths, graphical ability, quality and accuracy. Use of tools.	Students self evaluate the project and compile a list of improvements.
9	Finish practical work. Evaluate project.	Finish, clean sand and stain, if needed.	Hinges, screws, PVA, stain, sandpaper, materials for lid design.	Maths, graphical ability, quality and accuracy.	None. Show, discuss and enjoy the work. Take it home and feel a sense of achievement.

This scheme of work is only a guide. Yours may differ depending on your teaching styles.

Assessment Rubric

	0 Level	1-2 Level	3-4 Level	5-6 Level
A Investigate	The student does not reach any of the standards described by the descriptors to the right.	The student designed several test pieces although the practical was not finished.	The student designed several test pieces and chose one to complete the work	The student designed several test pieces and created at least two alternatives to the finished work.
B Design	The student does not reach any of the standards described by the descriptors to the right.	The student's designs were all his/her own work.	The student designs were all his/her own work. S/he worked with only one material and used that for the finished work.	The student's designs were all his/her own work. S/he used various materials and was able to discuss why s/he settled on the final decision.
C Plan	The student does not reach any of the standards described by the descriptors to the right.	The student selected one design.	The student selected one design and verbally justified why.	The student selected one design and recorded on paper how to implement it and why it was chosen.
D Create	The student does not reach any of the standards described by the descriptors to the right.	The student created the product following the plan. S/he worked safely.	The student created the product following the plan. S/he worked safely using appropriate techniques. S/he was able to name some of the tools used on the project.	The student created the product following the plan. S/he worked safely and tidily, using a range of appropriate techniques. S/he was able to choose and name the tools used on the project.
E Evaluate	The student does not reach any of the standards described by the descriptors to the right.	The student suggested ways his/her product / performance could be improved.	The student evaluated the success of his/her design.	The student evaluated the success of his/her design and materials used. S/he suggested materials used. S/he suggested ways his/her product could be improved.
F Attitudes in Technology	The student does not reach any of the standards described by the descriptors to the right.	The student provided evidence of personal engagement with the subject.	The student provided evidence of personal engagement with the subject (motivation, positive attitude).	The student provided evidence of personal engagement with the subject (motivation, independence positive attitude).

TIME FRAME AND DURATION

- 7 to 9 Weeks at 2×60 min lessons per week.

AREA OF INTERACTION:

- Approaches to Learning, Human Ingenuity.

INTERDISCIPLINARY, CURRICULUM LINKS WITH:

- Maths, Graphics & Art.

SIGNIFICANT CONCEPTS:

- Outline the design brief.
- Select one design and justify its choice.
- Evaluate the plan and justify any modifications to the design.
- Ensure a safe working environment for themselves and others.
- Follow the plan to produce the product/solution.
- Explain how the product/solution could be improved.
- Carry out units of work in Technology using materials and techniques safely and responsibly.

MYP UNIT QUESTION

- How can we best enhance a given product / design?

Sub questions:

- Why do we generate several designs?
- Do we rush to meet deadlines or sacrifice reward for quality?
- Why do we record our ideas?

ASSESSMENT: STUDENTS WILL:

- Complete the worksheets provided (4) (specifically for this project).
- Accurately mark out work using previously completed worksheets.
- Follow the stages correctly for fabrication of project, using appropriate tools.
- Produce A4 dimensioned third angle drawing of the project.
- Design several alternatives for the lid of the box.
- Justify how to make and why the final design was chosen.
- Ensure a safe working environment at all times.
- Evaluate their work and also the project in general.

MYP OBJECTIVES TO BE ADDRESSED:

- Investigate Design, Plan, Create, Evaluate, ATL.

PREVIOUS KNOWLEDGE AND SKILLS TO BE USED:

- Mathematical skills, for the marking out and preparation, prior to fabrication.
- Basic hand tool and previous workshop experience for fabrication of project.
- Isometric drawing experience for creating third angle working diagrams.

APPROACHES TO LEARNING:

- The unit is aimed to take the students into understanding the inner ring of the design cycle. Strong emphasis is placed on “Student Centred Learning” as they should already hold a basic knowledge of hand tools.

LEARNING EXPERIENCES:

- The students should be introduced to third angle projection using basic shapes. From this stage they should be able to construct low level third angle sketches, internationally recognizable in construction.
- After completing the pre developed worksheets to gain an understanding of the unit. The student should be able to individually work on the practical part of the unit.
- Students will acquire knowledge by completing the various tasks.
- It is expected or presumed that students have prior knowledge of the subject gained in previous units before beginning this project.

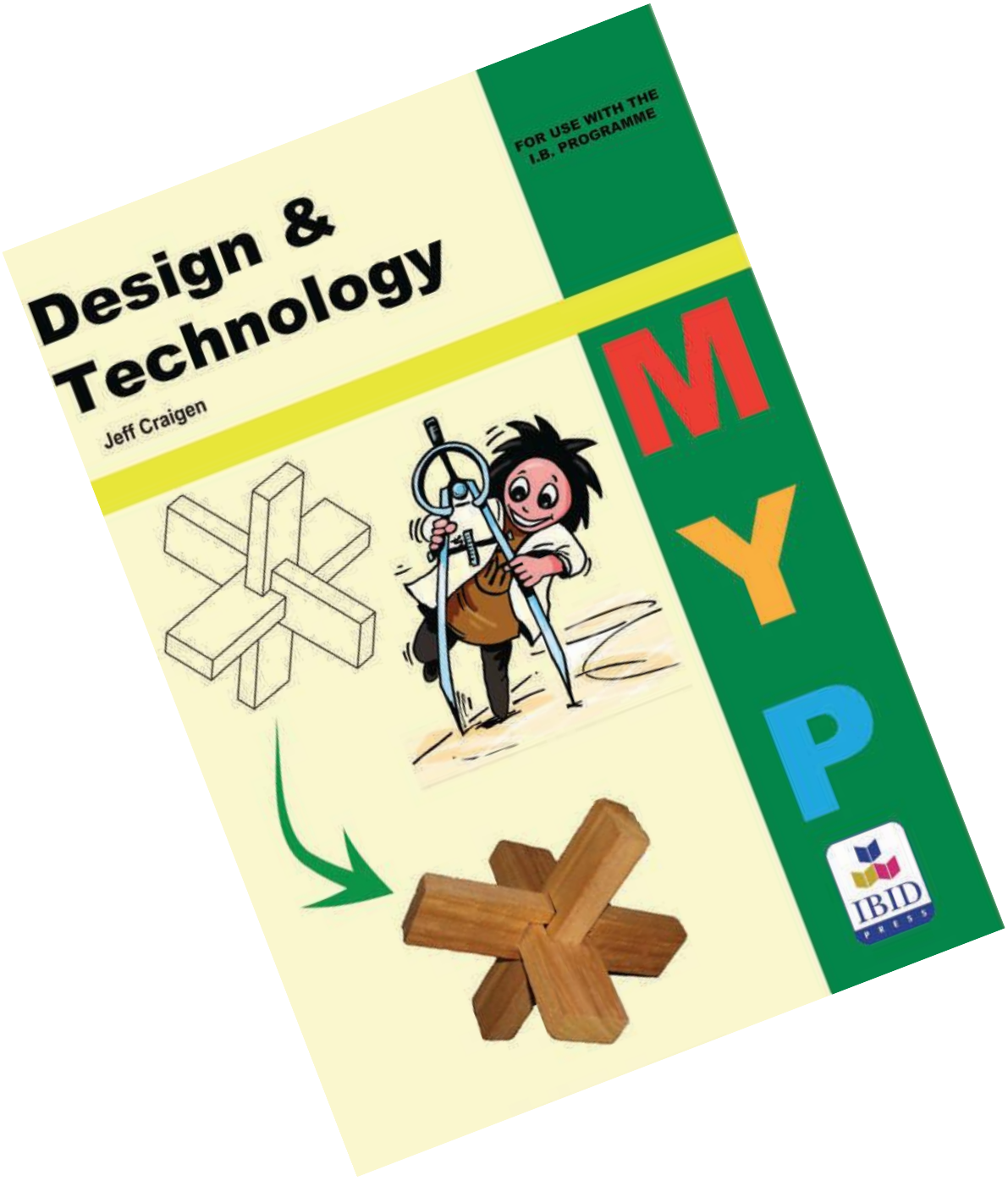
TEACHING STRATEGIES:

- The project has huge scope for differentiation as in the starting point or the stages (can easily be adjusted) as required by the teacher.
- This is a highly visual project and students with language difficulties and to some extent learning difficulties can follow the step by step pictorial guide in the booklet.
- The project is aimed at student centred learning. Whereby the student is aware of what is required and manages the tasks to suit availability of equipment and stages needed.
- Assessment will be based on the finished practical and submitted third angle projection drawing. Student understanding (and therefore assessment) will become obvious once the practical work begins. Feedback on the tasks will be marked on the sheets and through verbal discussions during practical.

RESOURCES:

- The project will be based solely in the DT room to allow students to become comfortable with the workshop. However constant reference to external manufacturing and material availability will be referenced.

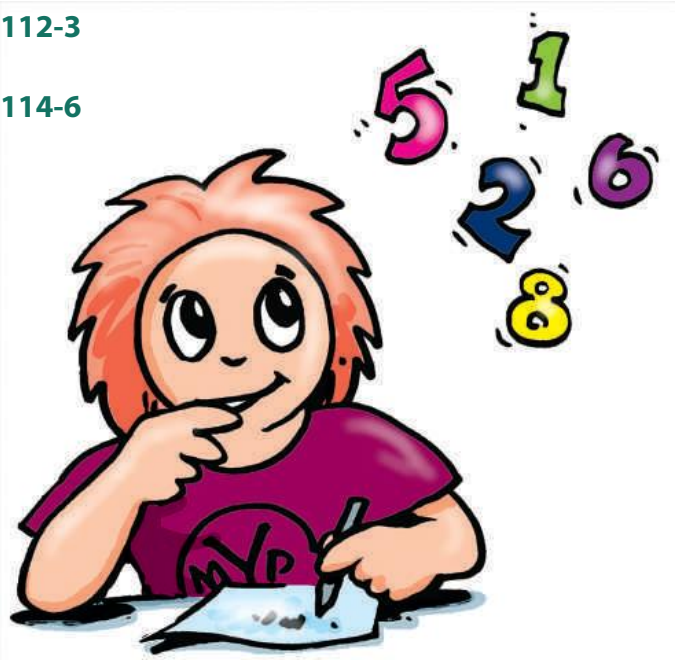
THE DESIGN CYCLE



CONTENTS

THIS SECTION PROVIDES SOME GENERAL WORKSHEETS THAT TEACHERS MAY FIND USEFUL WITH THEIR STUDENTS, WHATEVER PROJECT THEY ARE UNDERTAKING.

THESE SHEETS HAVE BEEN DESIGNED TO HELP STUDENTS PLAN THEIR PROJECTS THOROUGHLY. THEY FOLLOW THE DESIGN CYCLE



ASSESSMENT RUBRIC

	0 Level	1-2 Level	3-4 Level	5-6 Level
B Design	The student does not reach any of the standards detailed by the descriptors to the right.	The Student has completed some of the four design brief worksheets. S/he has shown a basic understanding of the project in drawing form.	The Student has completed the four design brief worksheets. S/he has shown a fair understanding of the project. S/he has constructed a fair isometric representation of the project.	The Student has completed the four design brief worksheets to a high standard. S/he has shown a good understanding of the project. S/he has produced a high standard isometric drawing of the project.
C Plan	The student does not reach any of the standards detailed by the descriptors to the right.	The student has limited understanding of task management. S/he has not been able to complete the project.	The student has an understanding of task management. S/he has been able to complete the project on time.	The student has planned out the use of time over available equipment. S/he understands and has managed the tasks effectively.
D Create	The student does not reach any of the standards detailed by the descriptors to the right.	The student created the product. S/he worked safely.	The student created the product according to the approved design and following the plans. S/he worked safely and tidily throught the unit.	The student created the product according to the approved design and following the plans. Their work is accurate and well finished. S/he worked safely and tidily throught the unit.
E Evaluate	The student does not reach any of the standards detailed by the descriptors to the right.	The student provides a very basic rating of his/her performance.	The student provides a basic rating of his/her performance and reflects on possible improvements they might make in future work.	The student provides an overall rating of his/her performance. S/he justifies the rating and reflects on possible improvements they might make in future work.
F Attitudes to technology	The student does not reach any of the standards detailed by the descriptors to the right.	The student provides little evidence of personal engagement with the subject.	The student provides evidence of personal engagement with the subject (general positive attitude to technology).	The student provides evidence of personal engagement with the subject (independence, general positive attitude to technology).

Design Process Worksheet

KNOWING THE PROJECT — TECHNOLOGY

Project -

Problem

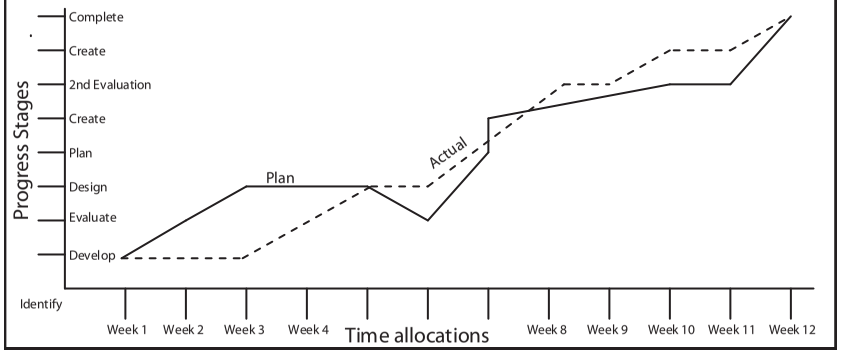
.. . .

.. . .

.. . .

.. . .

Time Plan (example only)



Brief

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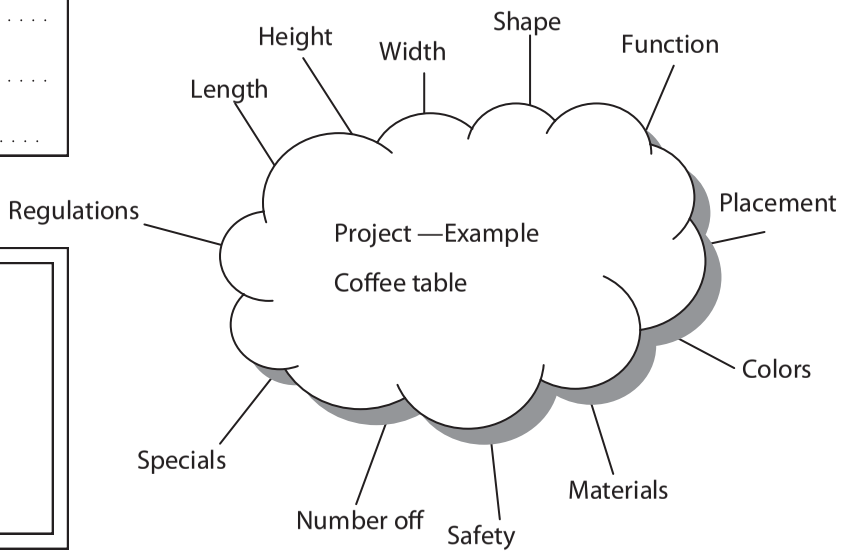
. . . . . .

Brainstorm 1



Client (if applicable)

.. . .

Name (Who is it for)

.. . .

Age, Special Criteria etc...

.. . .

Any relevant details

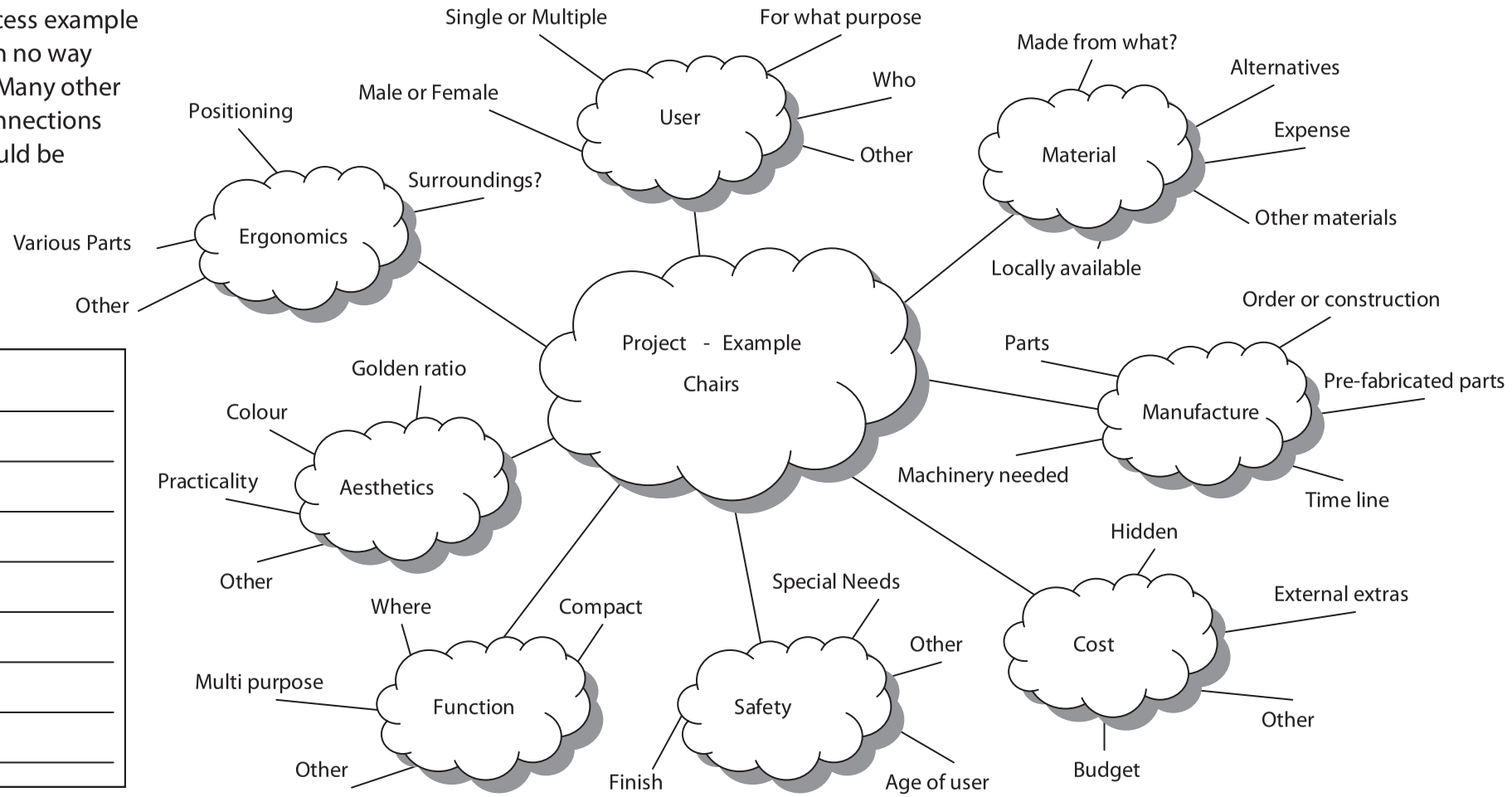
.. . .

Picture
If
possible

Notes to evaluate this page.

Brainstorm

This is a process example only and is in no way completed. Many other links and connections can and should be included



Notes : -

Task Analysis : -

Research Introduction

In researching this project I will utilize as many avenues as I have available to me. Some examples are : - Internet search, Catalogues, Existing media on my project, Contacting companies within the field of my project.

Company Name and Address

Your Name and Address

Date

Dear Sir, (example)

I am a technology student at (school name). My project involves researching existing products and understanding the design process.

(Be polite and genuine. Perhaps state why you have chosen this project)

Yours Sincerely

Name

Contacted Companies (persons)

Company Name	Company Name	Company Name
Address Postal code	Address Postal code	Address Postal code
Telephone	Telephone	Telephone
Website	Website	Website
Email	Email	Email

Websites

WWW. Fredblogs. co.uk

WWW. Craigen.com

WWW. Whatever . com

Responses : -

(who, what, how etc…)

Existing Products 1

Manufacture : -

User : -

Materials : -

Function : -

Cost : -

Safety : -

Aesthetics : -

Ergonomics : -

Manufacture : -

Existing Products 2

Manufacture : -

User : -

Materials : -

Function : -

Cost : -

Aesthetics : -

Safety : -

Ergonomics : -

Manufacture : -

Existing Products 3

Manufacture : -

User : -

Materials : -

Function : -

Cost : -

Safety : -

Aesthetics : -

Ergonomics : -

Manufacture : -

Questionnaire

Questionnaire

Gives an explanation of why you are using the questionnaire, and who you are going to give it to.

Questions

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

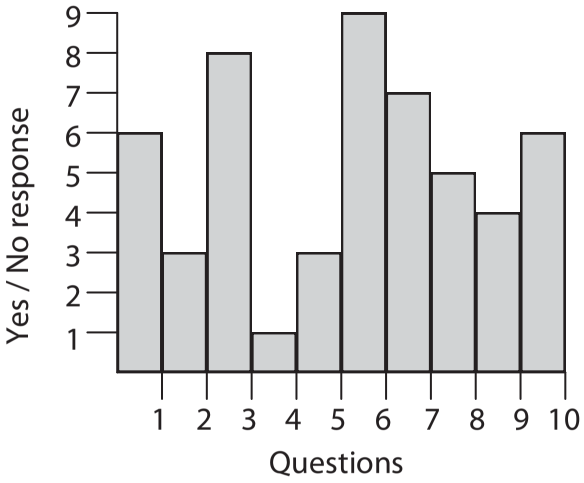
7 _____

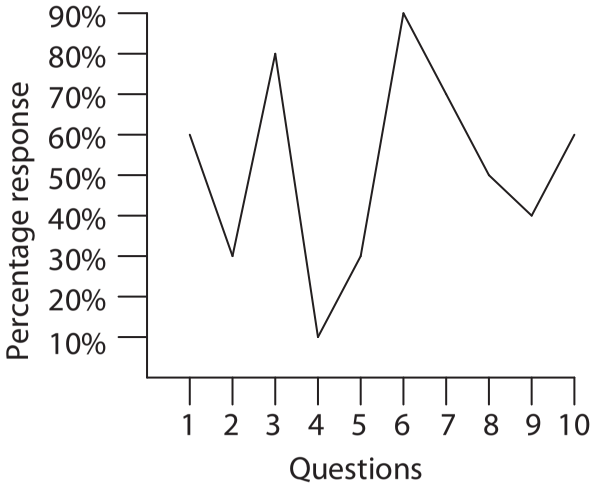
8 _____

9 _____

10 _____

Ten questions are compulsory in this section





TYPES OF QUESTIONS

Open questions These are useful in getting another person to speak. They often begin with the words: What, Why, When, Who?
Sometimes they are statements: "tell me about...", "give me examples of...".
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Questionnaire Evaluation

Questionnaire Evaluation

Think about your questions before finalizing them. Ask a second person to evaluate them.

What type of questions are they?

Questions

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

9 _____

10 _____

Second person's evaluation

Notes on responses to questionnaire.

Material / Manufacture

Material required……

(size i.e. 100mm x 20mm x 400mm pine)

(300mm x 300mm x 5 mm plastic sheet)

(200mm x 200mm white cotton cloth)

Manufacture (joints, connections, machinery needed)

(Mortise drill, dove-tail joints, finger joints, welding, brazing)

Cutting list …….

(i.e.... 4 off 100mm x 20mm x 100mm)

(3 off 300mm x 100mm x 5mm plastic strips)

(4 off 50mm x 50mm white cotton cloth)

Assistance, guidance .

(Skills, new skills, research into 'how')

Specials and consumables …….

(PVA glue, tacks, bolts screws, etc)

Specials

(bought items, inserts, specially made parts)

Specification Sheet (notes)

Time Scale

Function

Performance

Size

Weight

Target Market

Life in Service

Aesthetics

Ergonomics

Materials

Safety

Cost

Reliability

Manufacture Quantity

Possible Conflicts

Research — What's been done? What do I like? Requirements versus Design.

Development of Initial Ideas 1

Picture

Positive _____

Negative _____

Picture

Positive _____

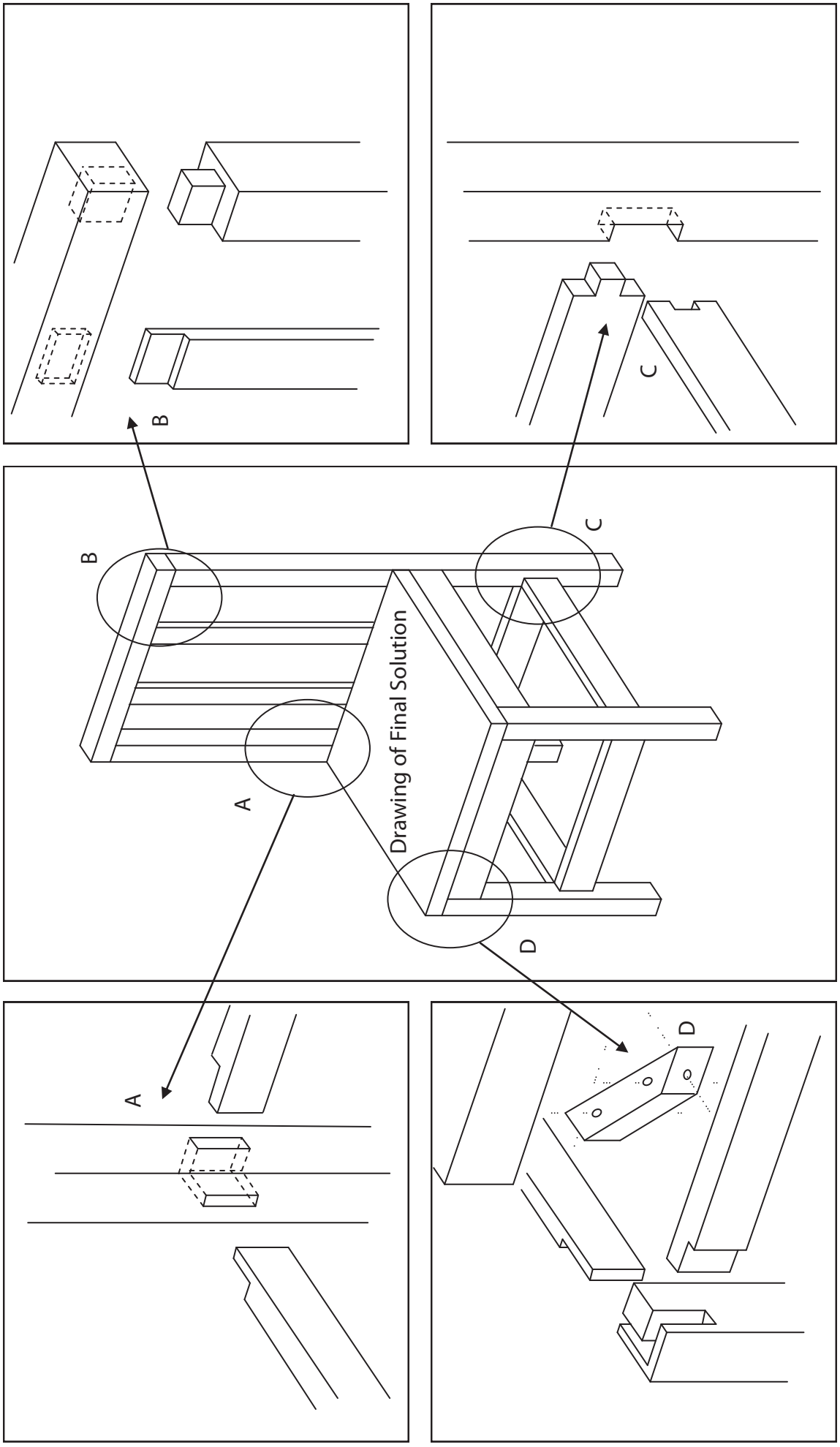
Negative _____

Picture

Positive _____

Negative _____

Final Solution



Working Drawings

Cutting List

1 - Rear Legs, 900mm x 60mm x 50mm, 2 off

2 - Front Legs, 470mm x 60mm x 50mm, 2 off

What this means

1 (The Item in question on the drawing)

Rear Legs (a general description of part)

900mm (always length first 900mm = 90cm)

60mm (largest width first)

50mm (Final width)

2 off = 2 of the same pieces are required

Estimate the following parts

A -

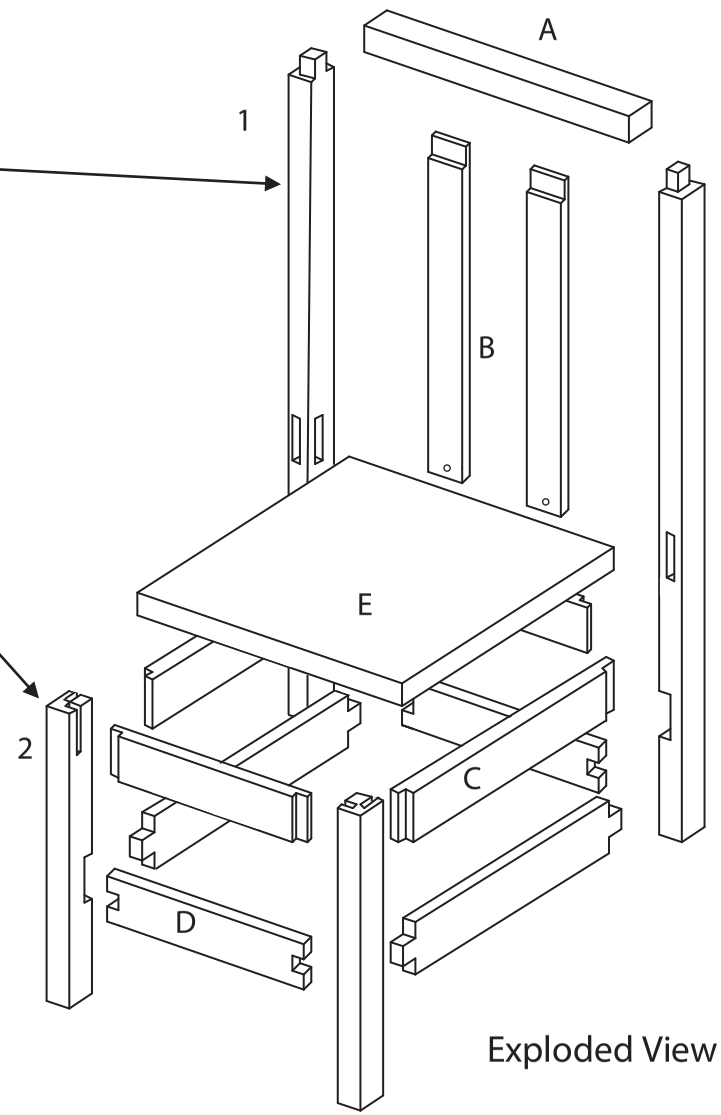
B -

C -

D -

E -

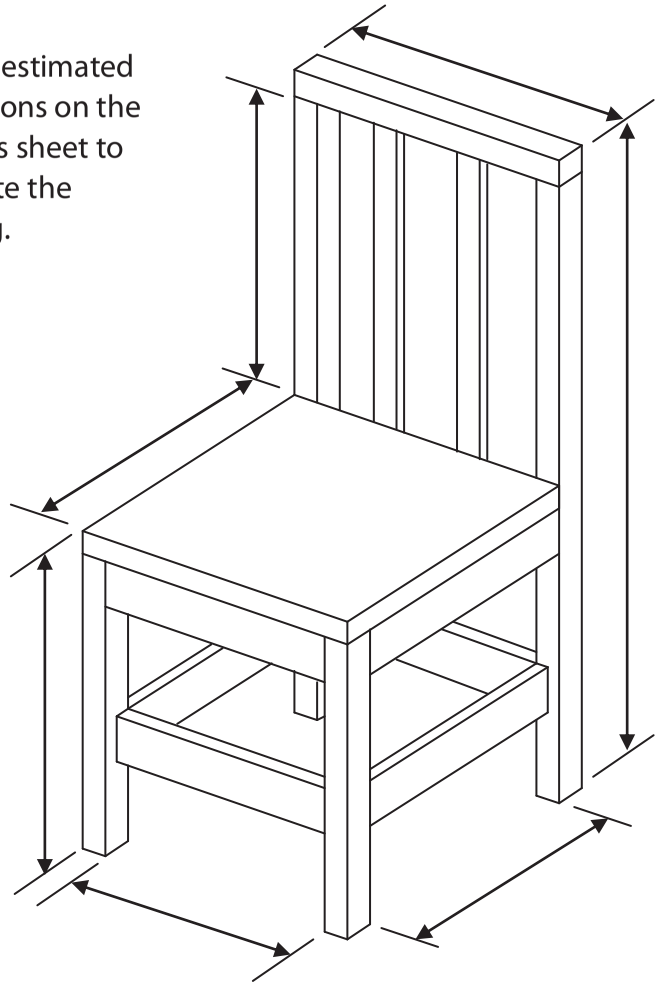
When ordering, total up the same size parts, add together and plus 10% for cutting and marking.



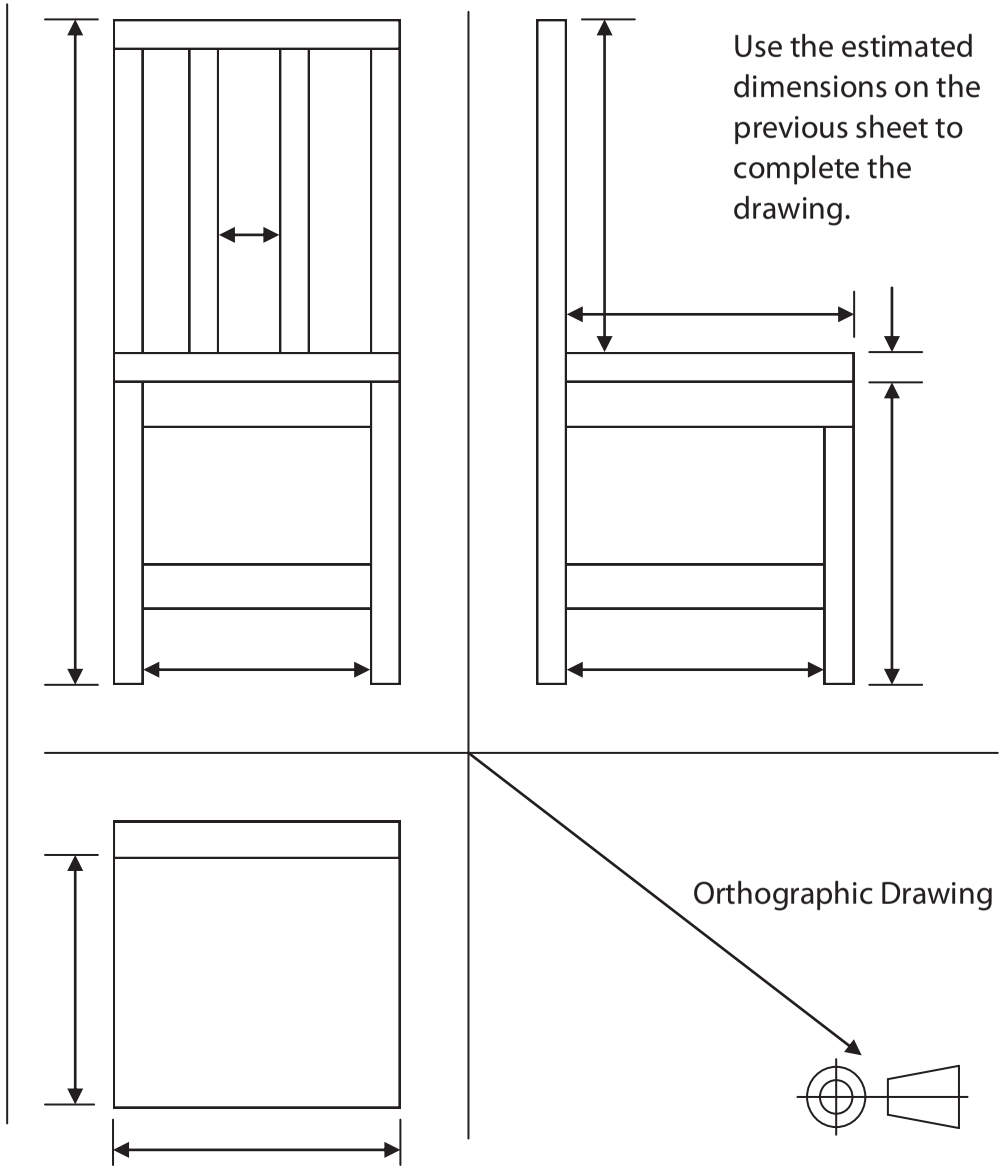
Exploded View

Working Drawings

Use the estimated dimensions on the previous sheet to complete the drawing.



Isometric View

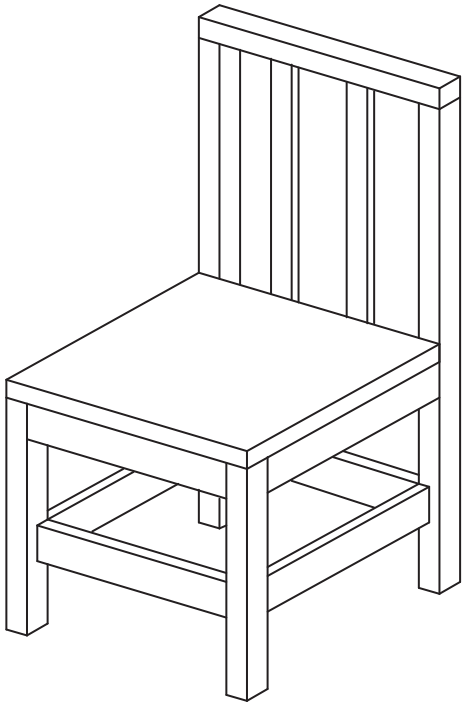


Use the estimated dimensions on the previous sheet to complete the drawing.

Orthographic Drawing

Testing of Products

Critical self evaluation of finished product.



Critical user evaluation of finished product. (This is for product development, be honest.)

Evaluation

Introduction (Describe how your initial ideas have changed)

Process continued …….

Detail the process of making your product.

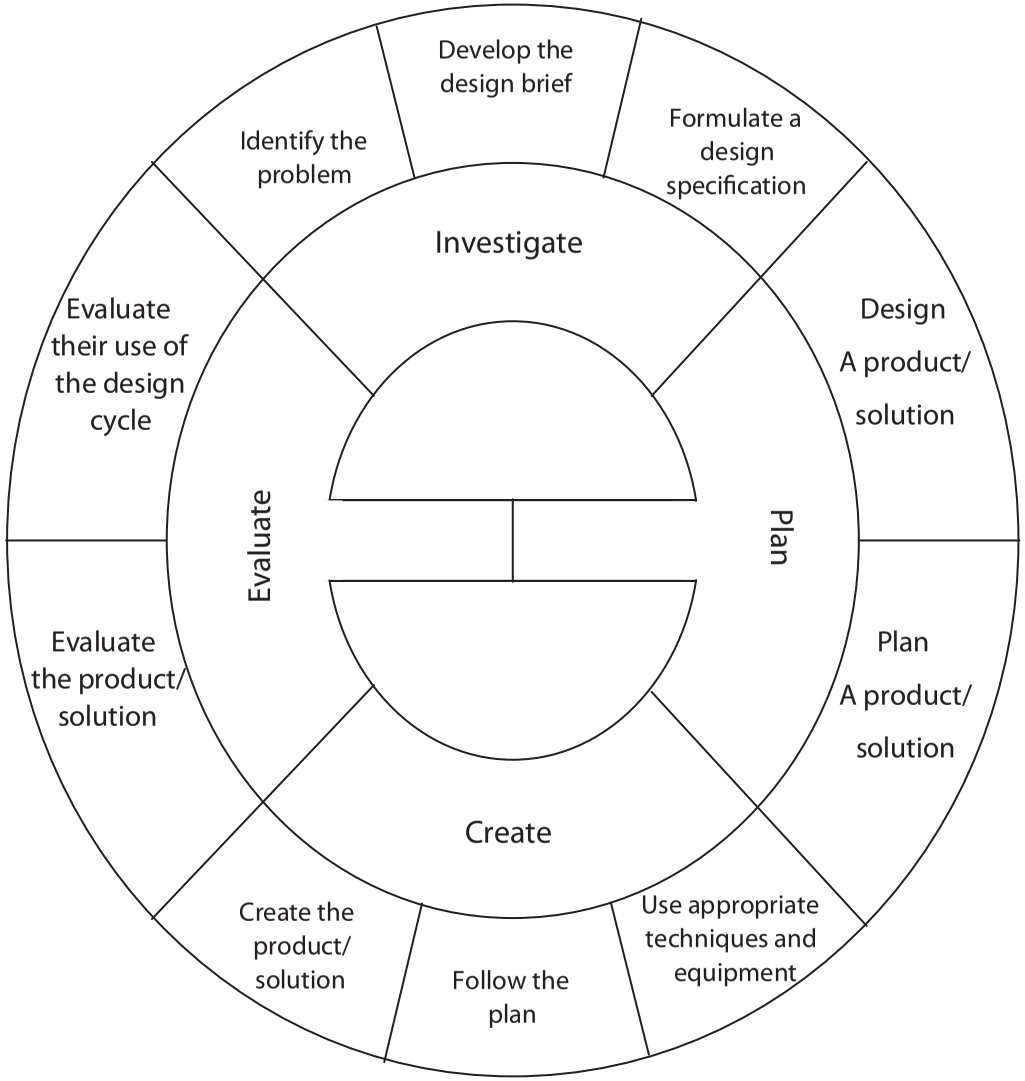
What exactly is your project?

Future Development

Scribble page for other peoples suggestions and ideas on possible future changes.

Be prepared to accept the bad comments with the good. It is all useful information for future development. Also be prepared for silly comments that don't help at all.

The Design Cycle



The Design Cycle Worksheets

Design Process Worksheet

Problem

Brief

Client (if applicable)
Name (Who is it for)
Age, Special Criteria etc.,
Any relevant details

Picture if possible

Time Plan (example only)

Brainstorm 1
Height, Width, Shape, Function, Placement, Colors, Materials, Safety, Number off, Special?, Regulations, Project—Example Coffee table

Notes to evaluate this page:

Brainstorm

This is a process example only and is in no way completed. Many other links and connections can and should be included

Project - Example Chairs
User, Who, Other
Made from what?, Alternatives, Expense, Other materials
Material, Locally available
Manufacturers, Parts, Pre-fabricated parts, Time line
Defence construction
Hidden, External stress, Other
Cost, Other
Budget
Age of user, Finish, Function, Other
Special Needs, Other
Multi purpose, Other
Where, Compact
Mechanics, Pre-drilling, Other
Get dirty with
Colour
Positioning, Symmetrical, Various Parts, Other
Same as Why?, Malformed?
Singular/Multiple, For what purpose

Notes : -

Task Analysis : -

Research Introduction

In researching this project I will utilise as many avenues as I have available to me. Some examples are : - Internet search, Catalogues, Existing media on my project, Contacting companies within the field of my project.

Company Name, Address Postal code, Telephone, Website, Email

Company Your Name and Address, Name and Address, Date

Dear Sir, (example)

I am a technology student at (school name). My project involves researching existing products and understanding the design process.

(be polite and genuine. Perhaps state Why you have chosen this project)

Yours Sincerely
Name

Contacted Companies (persons)

Company Name, Address Postal code, Telephone, Website, Email

Company Name, Address Postal code, Telephone, Website, Email

Websites
WWW.Fredlogo. co.uk
WWW. Craigen.com
WWW.Whatever . com

Responses : -

(who , what, how etc....)

Existing Products 3

Manufacture : -
User : -
Materials : -

Existing Products 2

Manufacture : -
User : -
Materials : -

Existing Products 1

Manufacture : -
User : -
Materials : -
Function : -
Cost : -
Safety -
Aesthetics : -
Ergonomics : -
Manufacture : -

Scribble page for other peoples suggestions and ideas on possible future changes.

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Primary Research (visit)

Detail of Visit : -
Picture
Picture
Picture
Visit Interview : -

Testing of Products

Critical self evaluation of finished product.

Critical user evaluation of finished product. (This is for product development, be honest.)

Questionnaire

Questionnaire
Gives an explanation of why you are using the questionnaire, and why you are going to give it to.

Questions
1 .....
2 .....
3 .....
4 .....
5 .....
6 .....
7 .....
8 .....
9 .....
10 .....

Ten questions are a compulsory in this section

Very Responsive
Questions
Percentage
Questions

TYPES OF QUESTIONS

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8 .....
9 .....
10 .....

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Notes on responses to questionnaire.

Final Solution

Drawing of Final Solution

Development of Initial Ideas 1

Positive
Negative
Picture

Research — What's been done? What do I like? Requirements versus Design.

Specification Sheet (notes)

Time Scale
Function
Performance
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(1 off 300mm x 100mm x 5mm plastic strips)
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