



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Junior Certificate 2016**

**Marking Scheme**

**METALWORK**  
**MATERIALS AND TECHNOLOGY**

**Ordinary Level**

## **Note to teachers and students on the use of published marking schemes**

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

## **Future Marking Schemes**

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

***METALWORK***  
***MATERIALS AND TECHNOLOGY***

**ORDINARY LEVEL, 2016**

**MARKING SCHEME**  
**Written Examination and Project**

***Note:*** For the written examination - Answer Question 1, Sections A and B and any three other questions - Total: 100 Marks.  
The solutions presented are examples only.  
All other valid solutions are acceptable and are marked accordingly.


**Question 1.**

**SECTION A - 20 MARKS**  
ANSWER ANY TEN QUESTIONS FROM THIS SECTION

**40 Marks**


(a)		This instrument is a(n):	<input type="checkbox"/> Odd-Leg Calipers <input type="checkbox"/> Vernier Calipers <input type="checkbox"/> Outside Calipers <input checked="" type="checkbox"/> Inside Calipers	<b>2</b>
(b)		A die is used for:	<input type="checkbox"/> Drilling <input type="checkbox"/> Reaming <input checked="" type="checkbox"/> Threading <input type="checkbox"/> Riveting	<b>2</b>
(c)		This lathe part is called a:	<input type="checkbox"/> Topslide <input type="checkbox"/> Chuck <input type="checkbox"/> Headstock <input checked="" type="checkbox"/> Tailstock Centre	<b>2</b>
(d)		This tool is a:	<input type="checkbox"/> Machine Vice <input checked="" type="checkbox"/> Hand Vice <input type="checkbox"/> Vice Grips <input type="checkbox"/> G-Cramp	<b>2</b>
(e)		Part 'X' is called the:	<input checked="" type="checkbox"/> Shank <input type="checkbox"/> Body <input type="checkbox"/> Land <input type="checkbox"/> Flute	<b>2</b>
(f)		This tool is a:	<input type="checkbox"/> Ring Spanner <input checked="" type="checkbox"/> Socket Wrench <input type="checkbox"/> Adjustable Spanner <input type="checkbox"/> Open Spanner	<b>2</b>
(g)		This fastener is a:	<input type="checkbox"/> Spring Washer <input type="checkbox"/> Grub Screw <input checked="" type="checkbox"/> Wing Nut <input type="checkbox"/> Lock Nut	<b>2</b>
(h)		This cutting tool is a:	<input checked="" type="checkbox"/> Flat File <input type="checkbox"/> Square File <input type="checkbox"/> Half Round File <input type="checkbox"/> Needle File	<b>2</b>
(i)		This mallet head is made from:	<input type="checkbox"/> Cast Steel <input checked="" type="checkbox"/> Rawhide <input type="checkbox"/> Mild Steel <input type="checkbox"/> Copper	<b>2</b>
(j)		This cutting tool is a:	<input checked="" type="checkbox"/> Straight Snips <input type="checkbox"/> Curved Snips <input type="checkbox"/> Combination Pliers <input type="checkbox"/> Bench Shears	<b>2</b>
(k)		Part 'X' is called the:	<input type="checkbox"/> Ratchet <input type="checkbox"/> Anvil <input checked="" type="checkbox"/> Thimble <input type="checkbox"/> Frame	<b>2</b>
(l)		This tool is used for:	<input type="checkbox"/> Counterboring <input type="checkbox"/> Reaming <input type="checkbox"/> Drilling <input checked="" type="checkbox"/> Countersinking	<b>2</b>

**SECTION B - 20 MARKS**  
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)  Name the **four** labelled parts of this desktop computer.


1.	<i>Visual Display Unit (VDU)</i>
2.	<i>Central Processing Unit (CPU)</i>
3.	<i>Mouse</i>
4.	<i>Keyboard</i>

④

(n)  List **three** advantages of using a tablet computer.

1.	<i>Light</i>
2.	<i>Easy to work with on journeys</i>
3.	<i>Quick to operate</i>

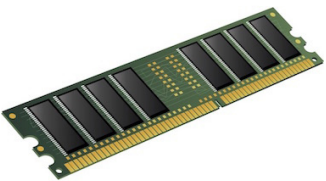
④

(o)  List **three** differences between this phone and a modern smartphone.


1.	<i>Touch screen on smartphone</i>
2.	<i>Better access to media</i>
3.	<i>Improved recording capability</i>

④

(p) (i) Computer memory is measured in:

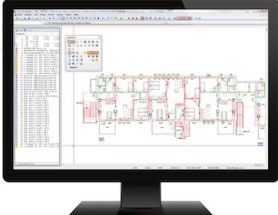
	Bytes	<input checked="" type="checkbox"/>
	Volts	<input type="checkbox"/>
	Grams	<input type="checkbox"/>
	Amps	<input type="checkbox"/>

(ii) This device is called a:


	USB Flash Drive	<input checked="" type="checkbox"/>
	Memory Card	<input type="checkbox"/>
	Hard Disk	<input type="checkbox"/>
	Floppy Disk	<input type="checkbox"/>

④

(q) (i) Technical drawings are produced using a:

	CAD package	<input checked="" type="checkbox"/>
	Spreadsheet	<input type="checkbox"/>
	Database	<input type="checkbox"/>
	Wordprocessor	<input type="checkbox"/>

(ii) A scanner is a:

	Storage Device	<input type="checkbox"/>
	Output Device	<input type="checkbox"/>
	Input Device	<input checked="" type="checkbox"/>
	Printing Device	<input type="checkbox"/>

④

**Question 2.**

**20 Marks**

**(a)**

(i) Which one of these metals is an alloy?

Aluminium	
Bronze	✓
Copper	

(v) Cuttlery is normally made from:

Silver Steel	
Stainless Steel	✓
Mild Steel	

(ii) Which one of these metals is hardest?

Lead	
Zinc	
Steel	✓

(vi) Drill bits used to drill steel are made from:

Mild Steel	
Cast Iron	
High Speed Steel	✓

(iii) Which one of these metals is the best conductor of electricity?

Copper	✓
Steel	
PVC	

(vii) Lead is a:

Brittle Material	
Malleable Material	✓
Strong Material	

(iv) Which one of these metals is the best conductor of heat?

Steel	
Lead	
Copper	✓

(viii) Zinc is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

8

**(b)** Answer the following by ticking the correct box:

(i) Is iron ore smelted in a blast furnace?	Yes	✓
	No	
(ii) Is hot air blown into a blast furnace when it is operating?	Yes	✓
	No	
(iii) Can a blast furnace be rotated to remove molten metal?	Yes	
	No	✓
(iv) Does a blast furnace use an electric arc as a source of heat?	Yes	
	No	✓
(v) Does a blast furnace produce steel?	Yes	
	No	✓
(vi) Does the molten metal fall to the bottom of a blast furnace?	Yes	✓
	No	

6

**(c)**

(i) Acrylic sheet is also known as:

Fibreglass	
Perspex	✓
Bakelite	

(iv) Window frames are made from:

Acrylic	
Nylon	
PVC	✓

(ii) Which one of these is a thermosetting plastic?

Bakelite	✓
Nylon	
PVC	

(v) The main raw material for plastic is:

Oil	✓
Wood	
Coal	

(iii) Which one of these is a thermoplastic?

Polyester Resin	
Polyethylene	✓
Phenolic Resin	

(vi) Polyethylene is used to make:

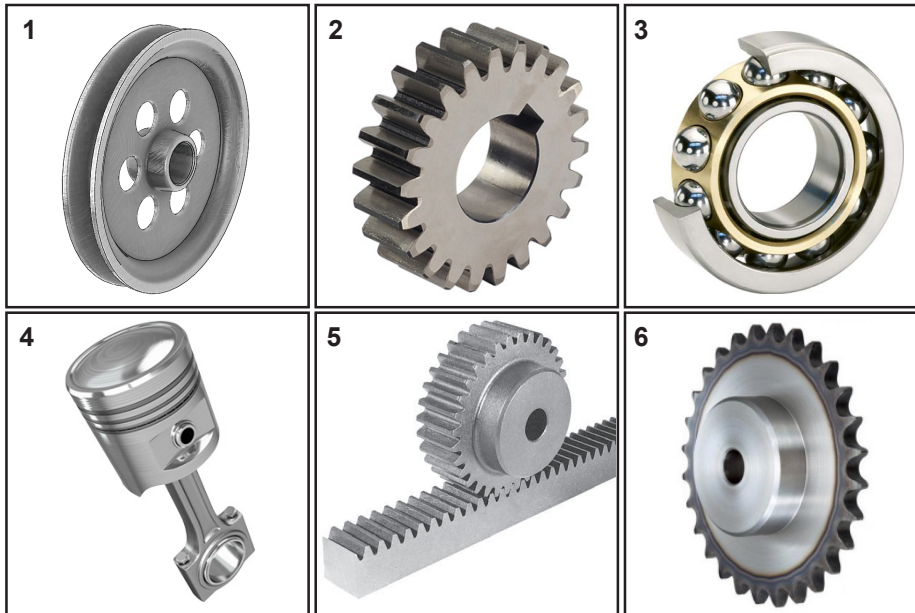
Bottles	✓
Foam	
Adhesives	

6

**Question 3.**

**20 Marks**

(a) (i) Match the number to the correct mechanism in the given table.

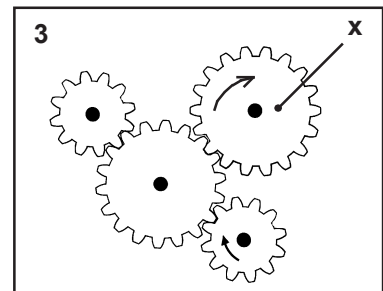
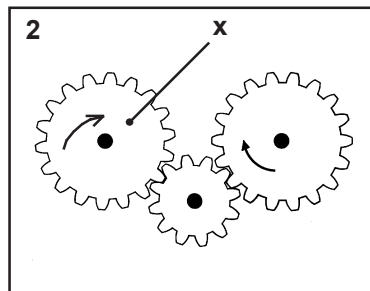
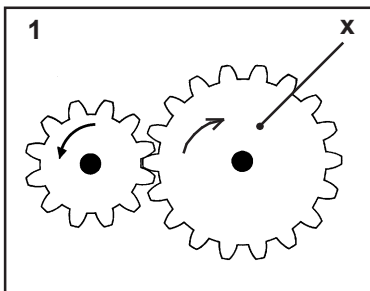


Mechanism	No.
Rack and Pinion	5
Bearing	3
Sprocket	6
Piston	4
Pulley	1
Gear	2

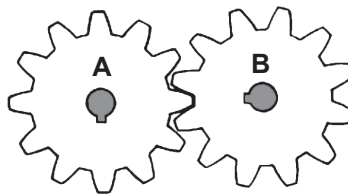
(ii) Name a machine in the school workshop that uses reciprocating motion.

*Scroll Saw*

(b) (i) Use an arrow to indicate the direction of gear 'X' in each of the following:



(ii) If gear 'A' rotates at 100 RPM how fast will gear 'B' rotate? (A = 12 Teeth, B = 12 Teeth.)



12 RPM	
50 RPM	
100 RPM	✓
200 RPM	

(iii) Name a machine that uses gears.

*Lathe*

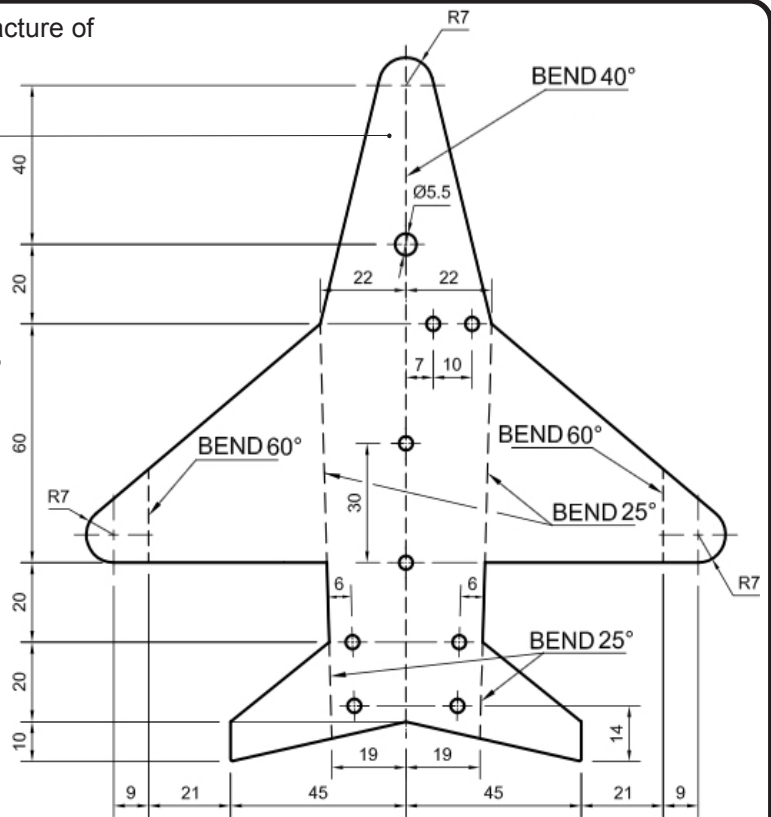
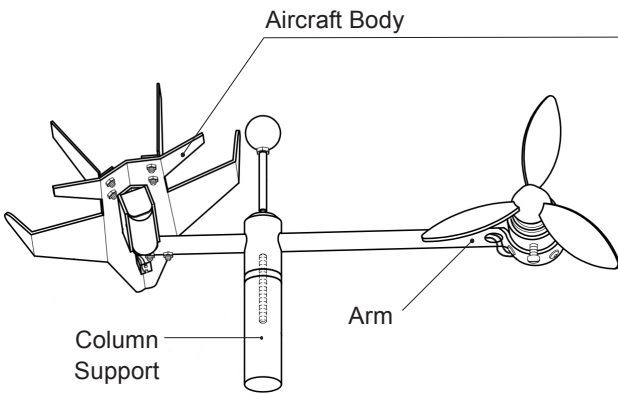
(c) Complete the table by naming devices that use the following mechanisms.

Mechanism	Device
Square Thread	<i>Lathe</i>
Cam	<i>Engines</i>
Ratchet and Pawl	<i>Socket Wrench</i>
Bevel Gears	<i>Hand Drill</i>
Rack and Pinion	<i>Drilling Machine</i>
Crank and Slider	<i>Power Hacksaw</i>
Linkage	<i>Vice Grip</i>

**Question 4.**

**20 Marks**

Details of the aircraft body used in the manufacture of a Model Fly-around Aircraft are shown.



(i) What is the overall length and width of the piece of metal used to make the aircraft body?

Length: 177 mm      Width: 164 mm

(ii) What does 'R7' refer to in the drawing?

Radius 7 mm

(iii) List the stages involved in bending the aircraft body to shape.

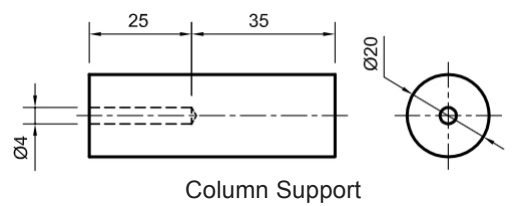
Using the bending machine bend the 40 degree line first. Next bend the 25 degree tail piece.  
 Finally bend the 25 degree wing tips.  
 Check the angles using an engineers protractor.

(iv) List **four** tools used in the manufacture of the aircraft body.

File  
 Tin snips  
 Folding bars  
 Drilling machine

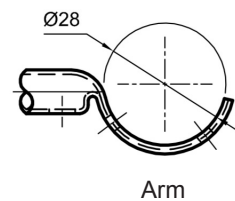
(v) Describe how you would drill the hole in the column support.

Secure the piece in the lathe chuck  
 Centre drill  
 Drill diameter 4 to a depth of 25 mm



(vi) Describe how you would form the end of the arm shown opposite.

Flatten the end of the bar using a vice or hammer.  
 Using a diameter 28 mm former, a vice and mallet  
 shape the curve at the end of the arm.



(vii) Why would you design and make a support stand for the model?

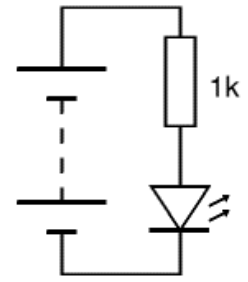
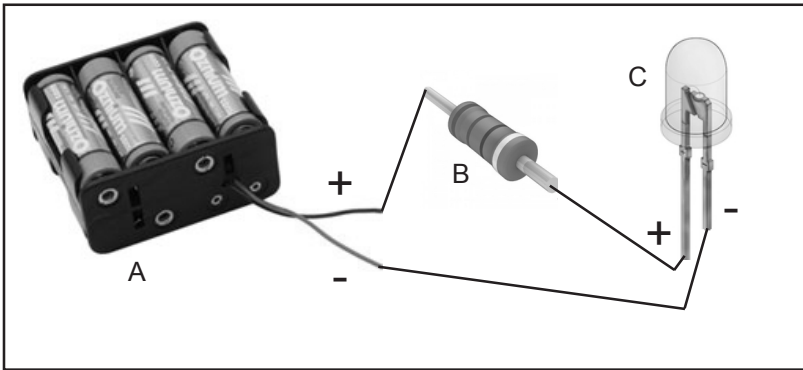
For display and to allow the model to function properly.



**Question 5.**

**20 Marks**

- (a) (i) Using the circuit diagram as a reference, draw the connecting wires between the components in the box below.



Circuit Diagram

- (ii) Name the components shown above.

A	Battery
B	Resistor
C	LED

- (iii) State a use for component 'C'.

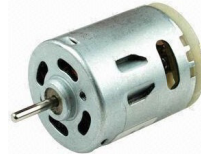
*Display sign*

- (b) (i) This device is a:



Toggle Switch	
Push Switch	<input checked="" type="checkbox"/>
Slide Switch	

- (iv) A motor converts electrical energy into:



Chemical Energy	
Light Energy	
Mechanical Energy	<input checked="" type="checkbox"/>

- (ii) Electrical current is measured in:



Amps	<input checked="" type="checkbox"/>
Ohms	
Volts	

- (v) This is a symbol for a:



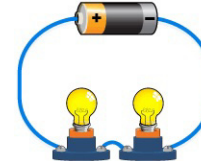
Bulb	<input checked="" type="checkbox"/>
Motor	
Dynamo	

- (iii) This device is a(n):



LDR	<input checked="" type="checkbox"/>
Buzzer	
Transistor	

- (vi) These bulbs are connected in:



Parallel	
Series	<input checked="" type="checkbox"/>
Parallel & Series	

- (c) Name any **two** inventors and briefly describe their achievements.

*Inventor 1:*  
*Nicholas Otto - Four stroke engine*

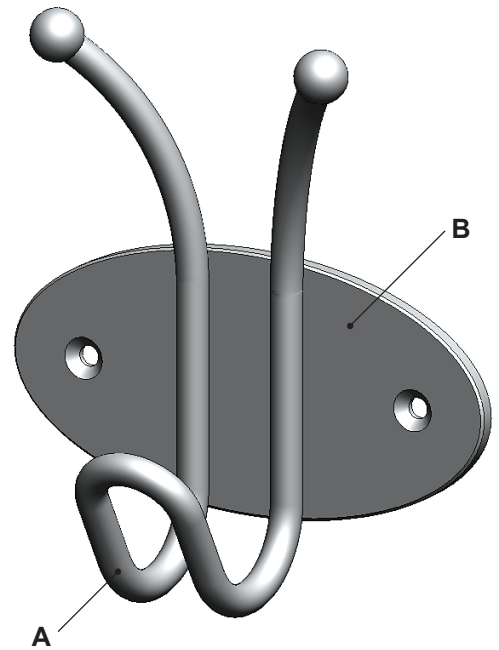
*Inventor 2:*  
*John B Dunlop - Pneumatic tyre*

Question 6.

20 Marks

(i) A design for a bathroom robe hook is shown. Name a metal suitable for making the robe hook. Give a reason for your choice.

Metal:	<i>Mild steel</i>
Reason:	<i>Easily joined</i>



(ii) Describe how you would bend the metal rod 'A' to shape.

<i>Heat the steel, then bend around formers of different diameters using a hammer.</i>

(iii) Describe how you would join parts 'A' and 'B'.

<i>Part A is joined to Part B by brazing.</i>
<i>Clean both parts using a file or emery cloth and apply flux. Then heat with torch until spelter melts.</i>

(iv) Describe a finishing process that could be used to enhance the bathroom robe hook.

Finishing Process: <i>Plastic coating</i>
<i>Clean the piece, heat using a furnace or torch</i>
<i>Dip into fluidizing unit, remove and allow to cool.</i>

(v) In the space below draw an alternative design for a robe hook.

<i>Excellent</i>	<i>4 Marks</i>
<i>Very Good</i>	<i>3 Marks</i>
<i>Good</i>	<i>2 Marks</i>
<i>Poor</i>	<i>1 Mark</i>

4

4

4

4


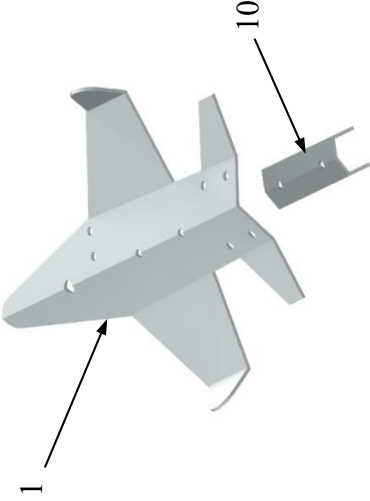
4



Coimisiún na Scrúduithe Stáit  
State Examinations Commission



Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2016

		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor				
		9 - 10 Excellent	7 - 8 Very Good	5 - 6 Good	3 - 4 Poor	1 - 2 Very Poor				
Section	Part Number	Pictorial Sketch/Description				Concept	Mark	Marks		
1	Complete Model (Not including Design Element)					Assembly: Subjective Grade 1 – 5	5	20		
						Finish: Subjective Grade 1 – 5	5			
						Mechanical Function: Subjective Grade 1 – 5	5			
						Electrical Function: Subjective Grade 1 – 5	5			
2	Design	Design, make and attach a <b>Decorative Support Stand</b> for the model.  (Note: 20% of the marks will be awarded for this section)				Design: Subjective Grade 1 – 10	10	20		
						Make: Subjective Grade 1 – 5	5			
						Attach: Subjective Grade 1 – 5	5			
3	Parts 1 & 10					Part 1 Aircraft Body	16	Mark Out	6	20
						Part 10 Battery Holder Support	4	Drill, Shape & Bend	10	
								Mark Out	2	
						Drill, Shape & Bend	2			



Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2016

4	Parts 7, 8, 2, 4 & 6		<b>Part 7</b> Left Tail Fin	5	Mark Out	2
				5	Mark Out	3
						3
				5	Mark Out	2
						3
				3	Mark Out & Thread	3
						2
				5	Mark Out	2
						3
				2	Lathe Work & Tap	2
3						
5	Parts 9, 3 & 5		<b>Part 9</b> Support Column	4	Lathe Work & Drill	4
				6	Mark Out	2
						4
				10	Mark Out	3
						7

100 Marks (× 3 = 300 Total)