



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

**Junior Certificate 2014**

**Marking Scheme**

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

**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.

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

## **ORDINARY LEVEL**










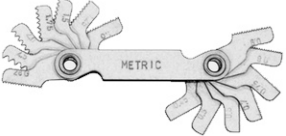


### **MARKING SCHEME** **Written Examination and Project**

***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.

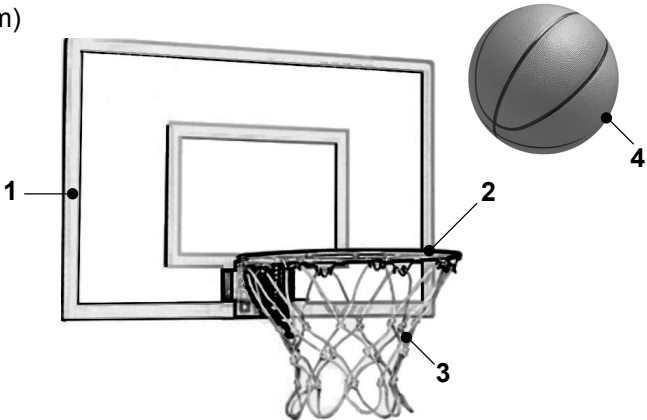
**SECTION A - 20 MARKS**  
ANSWER ANY TEN QUESTIONS FROM THIS SECTION

40 Marks

(a)		Part 'X' is called the:	Anvil		②
			Thimble		
			Ratchet	✓	
			Spindle		
(b)		This tool is a(n):	Adjustable Spanner		②
			Open Spanner		
			Combination Spanner	✓	
			Ring Spanner		
(c)		The tip of a dot punch is normally ground to an angle of:	30 degrees		②
			60 degrees	✓	
			120 degrees		
			180 degrees		
(d)		A tape rule can measure to an accuracy of:	1 mm	✓	②
			0.1 mm		
			0.01 mm		
			10 mm		
(e)		This cutting tool is a:	Split Die	✓	②
			Stock		
			Taper Tap		
			Plug Tap		
(f)		The picture shows a:	Vice Clamp	✓	②
			Pin Vice		
			Sliding Jaw		
			Hand Vice		
(g)		This tool is a(n):	Square Bit		②
			Phillips Bit	✓	
			Slotted Bit		
			Allen Bit		
(h)		This is a:	Panning Hammer		②
			Cross Pein Hammer		
			Ball Pein Hammer		
			Soft Hammer	✓	
(i)		This fastener is a:	Bolt		②
			Wing Nut	✓	
			Round Head Screw		
			Countersunk Screw		
(j)		This measuring tool is a:	Radius Gauge		②
			Drill Gauge		
			Screw Pitch Gauge	✓	
			Wire Gauge		
(k)		This calipers shown is a(n):	Vernier Calipers		②
			Odd-Leg Calipers		
			Outside Calipers		
			Inside Calipers	✓	
(l)		This tool is a:	Tap Wrench		②
			Stillson Wrench	✓	
			Adjustable Wrench		
			Channel Wrench		

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

(m)



(i) Complete the chart.

Part	Material
1. Backboard	<i>Acrylic</i>
2. Hoop	<i>Steel</i>
3. Net	<i>Nylon</i>
4. Basketball	<i>Rubber</i>

4

(ii) How would you fix the hoop to the backboard?

*Nuts and bolts*

2

(n)

How has the use of new materials improved the design of modern running shoes?



<i>Improved comfort</i>
<i>Reduces impact</i>
<i>Lightweight</i>

5

(o) (i) The ball pump gauge measures:



Heat	<input type="checkbox"/>
Pressure	<input checked="" type="checkbox"/>
Weight	<input type="checkbox"/>
Density	<input type="checkbox"/>

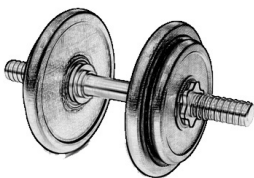
(ii) This stopwatch has a(n):



Analog Display	<input type="checkbox"/>
Antique Display	<input type="checkbox"/>
Transistor Display	<input type="checkbox"/>
Digital Display	<input checked="" type="checkbox"/>

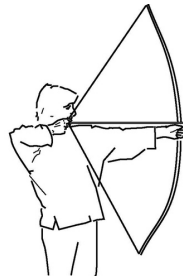
3

(p) (i) Weight plates are normally made from:



Cast Iron	<input checked="" type="checkbox"/>
Aluminium	<input type="checkbox"/>
Copper	<input type="checkbox"/>
Brass	<input type="checkbox"/>

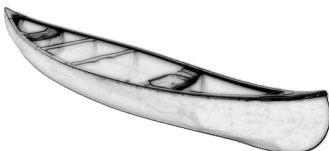
(ii) The bow string is in:



Compression	<input type="checkbox"/>
Tension	<input checked="" type="checkbox"/>
Shear	<input type="checkbox"/>
Torsion	<input type="checkbox"/>

3

(q) (i) Canoes are made from:



Acrylic	<input type="checkbox"/>
Fibreglass	<input checked="" type="checkbox"/>
Polyethylene	<input type="checkbox"/>
Polyurethane	<input type="checkbox"/>

(ii) Olympic medals are made from:



Silver, Gold, Pewter	<input type="checkbox"/>
Zinc, Gold, Silver	<input type="checkbox"/>
Silver, Bronze, Gold	<input checked="" type="checkbox"/>
Tin, Gold, Silver	<input type="checkbox"/>

3

**Question 2.**

**20 Marks**

**(a)**

(i) Plastic window frames are made from:

Acrylic	
PVC	✓
Polyester	

(v) A hand file is made from:

Mild Steel	
Medium Carbon Steel	
High Carbon Steel	✓

(ii) Galvanised iron is steel coated with:

Lead	
Zinc	✓
Aluminium	

(vi) Plastics that can be softened when reheated are called:

Thermoplastics	✓
Thermosetting Plastics	
Soft Plastics	

(iii) Brass is an alloy of:

Copper & Tin	
Copper & Zinc	✓
Copper & Steel	

(vii) Stainless steel is used to make:

Soldering Iron Bits	
Kitchen Foil	
Cutlery	✓

(iv) Cast Iron is a(n):

Brittle Material	✓
Plastic Material	
Elastic Material	

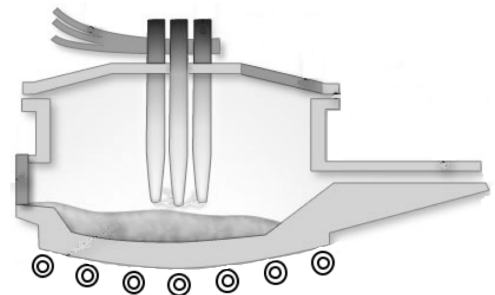
(viii) Lead is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

8

**(b)** Complete the table:

(i) This furnace is used to produce pig iron.	Yes	
	No	✓
(ii) This furnace can be tilted.	Yes	✓
	No	
(iii) Heat is generated using electrodes.	Yes	✓
	No	



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(iv) A water cooled lance is used to blow oxygen into this furnace.	Yes	
	No	✓
(v) Impurities in this furnace form to produce slag.	Yes	✓
	No	
(vi) Slag can be used as a fertilizer.	Yes	✓
	No	

**(c)** Complete the chart by listing a tool for each task.

Task	Tool
Measure the depth of a hole.	Depth Gauge
Draw an arc on a piece of metal.	Spring Dividers
Measure the diameter of a hole.	Inside Calipers
Clean a pinned file.	File Card
Hold a hot metal bar when forging.	Open Mouth Tongs
Remove a pin from a hole.	Pin Punch
Cut sheet metal by hand.	Tin Snips

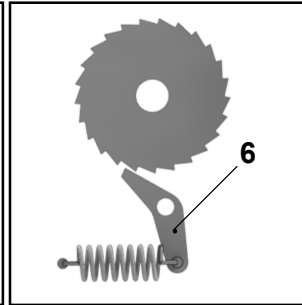
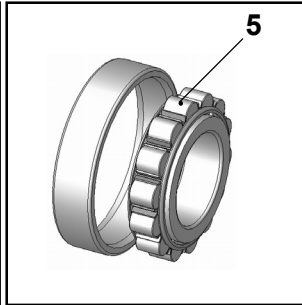
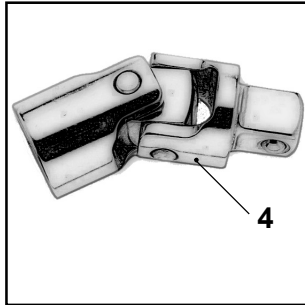
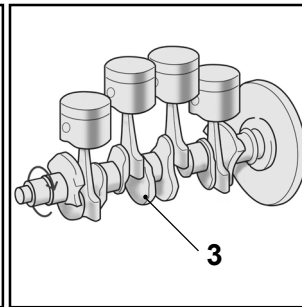
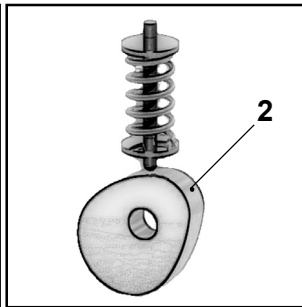
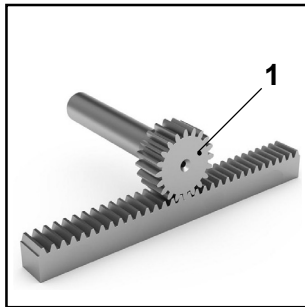
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**Question 3.**

**20 Marks**

⑥

(a) (i) Match the number to the correct mechanism part.



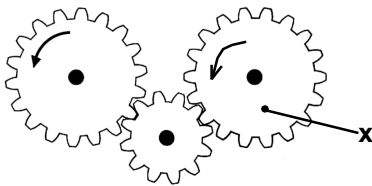
Mechanism	No.
Cam	2
Pawl	6
Universal Joint	4
Roller Bearing	5
Pinion	1
Crankshaft	3

(ii) What is a set of meshing gears called?

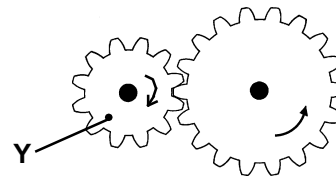
**Gear Train**

②

(b) (i) Indicate the direction of gear 'X'.



(iv) Indicate the direction of gear 'Y'.



(ii) Gear 'B' rotates at:

A=400 RPM  
A=10 Teeth, B=40 Teeth

400 RPM	<input type="checkbox"/>
100 RPM	<input checked="" type="checkbox"/>
40 RPM	<input type="checkbox"/>

(v) The driven gear rotates:

Driver      Driven

Faster	<input type="checkbox"/>
Slower	<input checked="" type="checkbox"/>
Same speed	<input type="checkbox"/>

(iii) The motion of the Jigsaw blade is:

Reciprocating	<input checked="" type="checkbox"/>
Linear	<input type="checkbox"/>
Oscillating	<input type="checkbox"/>

(vi) The motion produced when a swing moves is:

Reciprocating	<input type="checkbox"/>
Linear	<input type="checkbox"/>
Oscillating	<input checked="" type="checkbox"/>

⑥

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

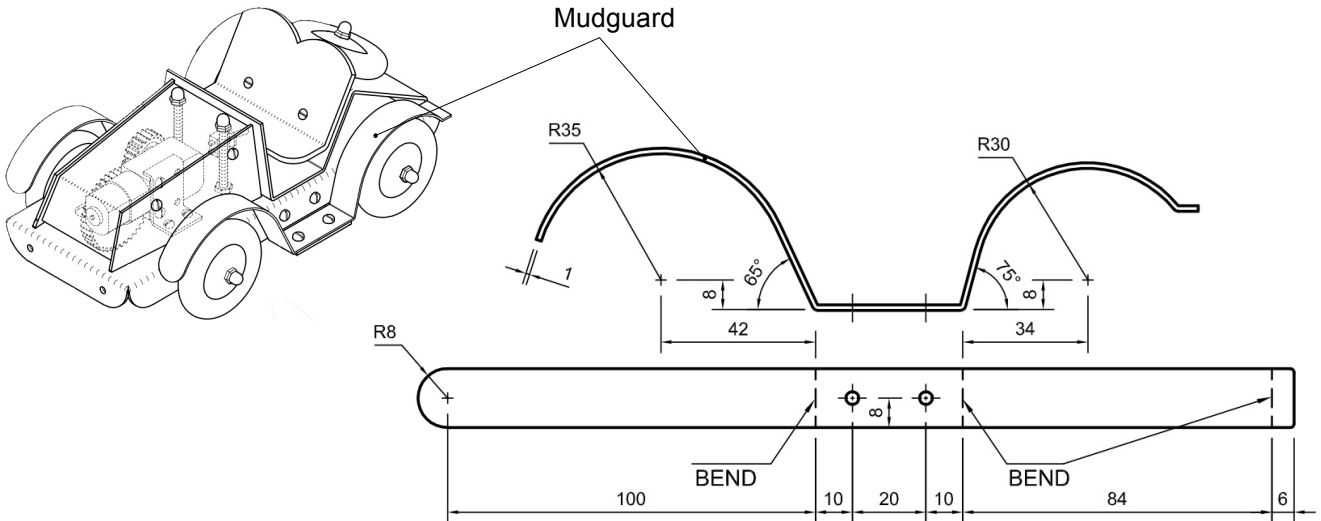
Mechanism	Device
Pulley	Washing machine
Bevel Gears	Hand drill
Lever	Bench shears
Screw Thread	G Clamp
Sprocket	Go-Karts
Clutch	Motorcycle
Bell Crank	Bicycle break system

⑥

**Question 4.**

**20 Marks**

Details of a mudguard used in the manufacture of a model grand tourer sports car are shown.



(i) Describe the stages involved in bending the mudguard to shape.

*Using a bending machine bend the 65 and 75 degree angles.*

*Using a diameter 70mm and 60mm formers, shape the curved sections.*

*Using a folding bar or bending machine make the final bend on the mudguard.*

④

(ii) What is the overall length and width of the piece of metal used to make the mudguard?

Length: 238mm

Width: 16mm

②

(iii) What tool would you use to check the 75° angle?

*Engineer's Protractor*

②

(iv) Describe how to apply a highly polished finish to the mudguard.

*Using a polishing machine and polishing compound.*

③

(v) Describe the stages involved in accurately marking out the mudguard support shown below.

*Using an odd-leg calipers set to 6mm and 8mm mark the position of the holes and dot punch.*

*Set the calipers to 20mm and mark the bend line.*

③

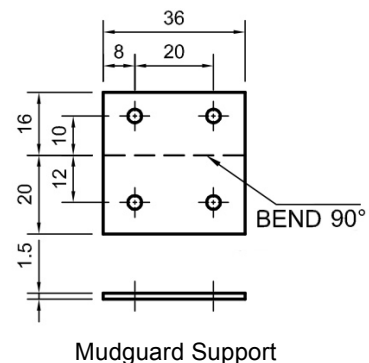
(vi) What precautions should be taken when drilling the mudguard support?

*Hold in hand vice.*

*Support piece.*

*Use correct speed.*

*Wear safety glasses.*



③

(vii) Describe how the wheels of the model grand tourer sports car are powered.

*Using an electric motor and gears.*

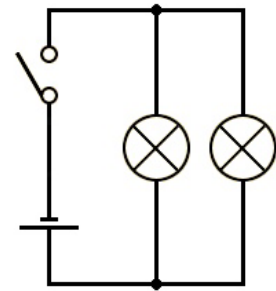
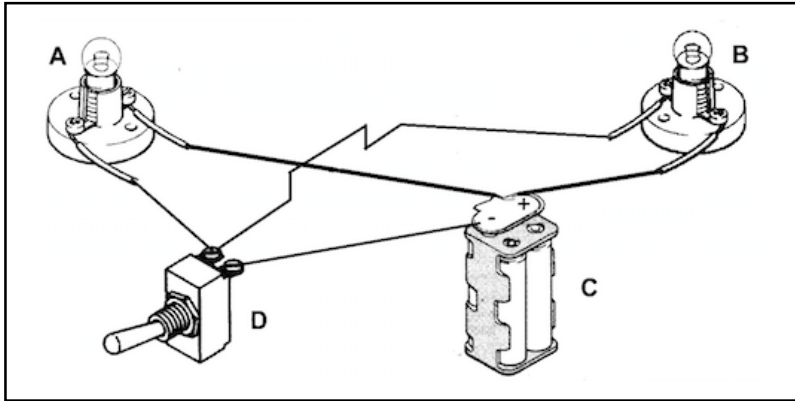
③



**Question 5.**

**20 Marks**

**(a)** (i) Using the circuit diagram as a reference, draw the connecting wires between the components **A**, **B**, **C** and **D** in the box below.



Circuit Diagram

(ii) Name the components shown above.

A	Bulb
C	Battery
D	Switch

(iii) What is the voltage output of the two batteries in series?

3 Volts



**(b)** (i) This cable is a(n):



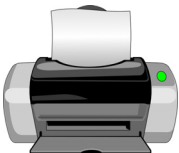
Power Lead	
Audio Lead	
USB Lead	✓

(iv) A toaster converts electrical energy into:



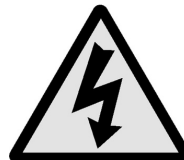
Solar Energy	
Chemical Energy	
Heat Energy	✓

(ii) A printer acts as a(n):



Output Device	✓
Input Device	
Process Device	

(v) The safety sign warns of a(n):



Fire Hazard	
Chemical Hazard	
Electrical Hazard	✓

(iii) The device is a:



Hard Disk Card	
Memory Card	✓
Computer Card	

(vi) Headphones convert electrical energy into:



Light Energy	
Sound Energy	✓
Electrical Energy	

**(c)** Name one famous Engineering inventor. Write a brief note about this person's invention.

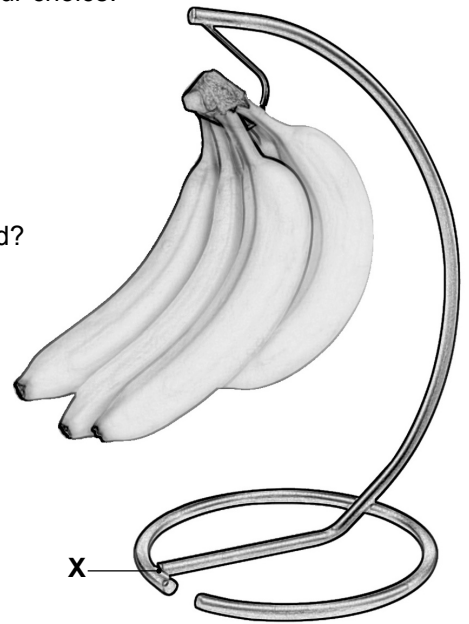
Inventor's Name:	Nicholas Otto
Invention:	Four stroke engine Used to power motor cars and motorcycles.

**Question 6.**

**20 Marks**

- (i) This design shows a kitchen stand for holding a bunch of bananas. Name a suitable metal to make the stand and give a reason for your choice.

Metal: <i>Brass</i>
Reason: <i>Does not corrode</i>



3

- (ii) What information would you need to know before making the stand?

<i>Diameter of the base</i>
<i>Height of the support</i>

3

- (iii) How you would join the metal parts at point 'X'?

<i>Solder</i>

3

- (iv) Describe how you would bend the stand to shape.

<i>Using a round former bend the base to shape</i>
<i>Using a round former shape the curve of the support</i>
<i>Using a bench vice and clamp shape the straight section of the support</i>

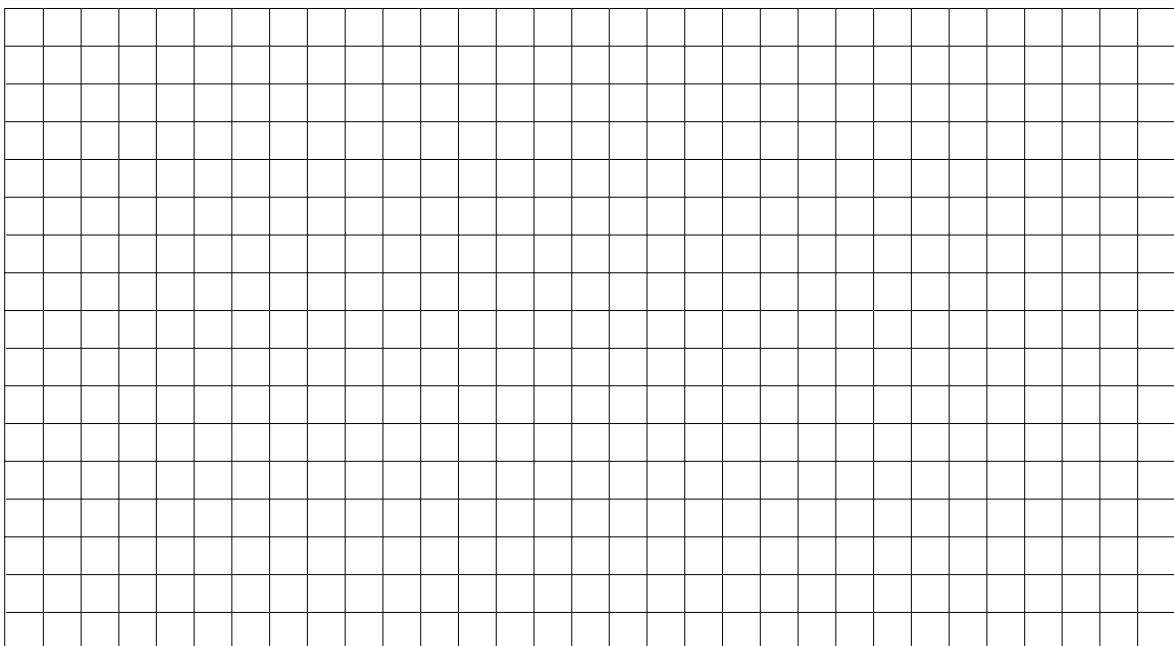
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- (v) Describe how would you would apply a finish to the stand.

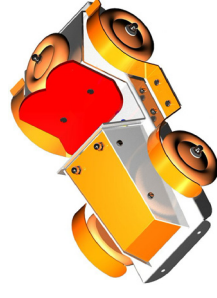
<i>Polishing and lacquering</i>

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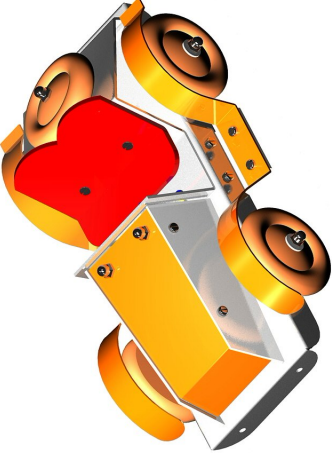
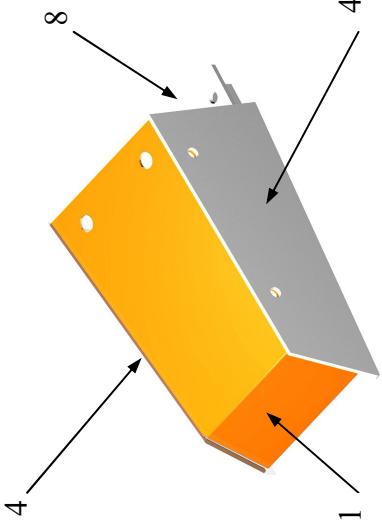
- (vi) Draw a more stable design for the kitchen stand shown in the grid below.

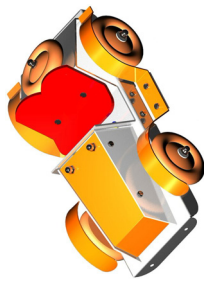


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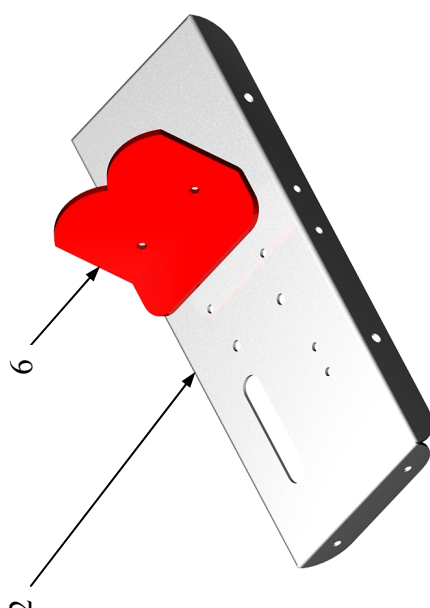
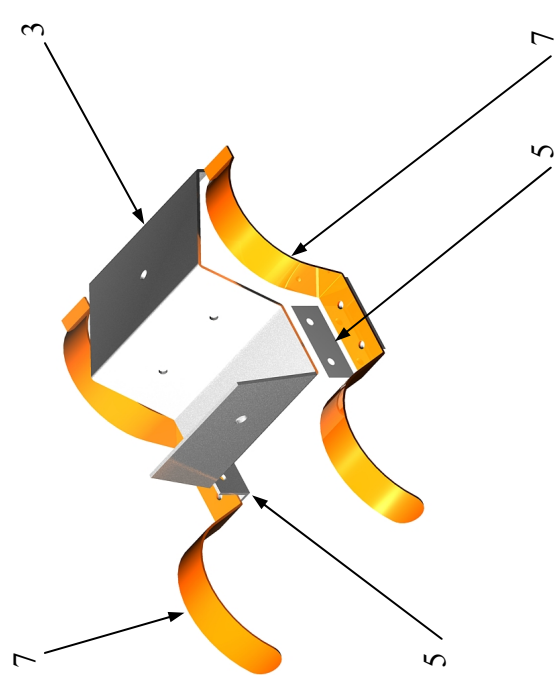
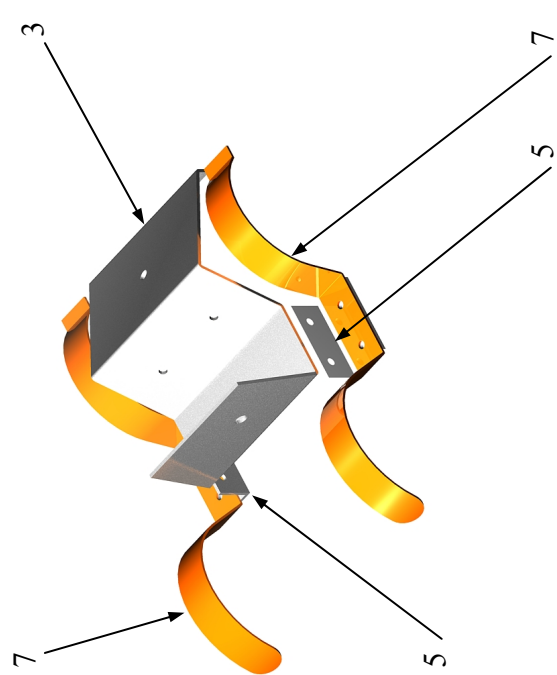
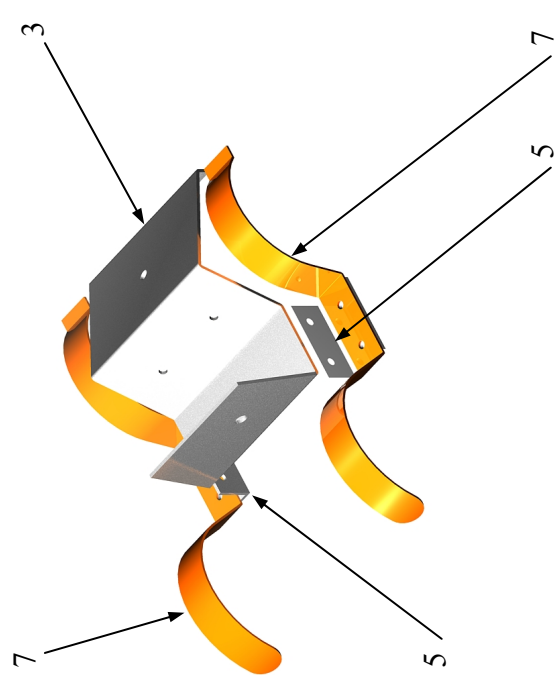
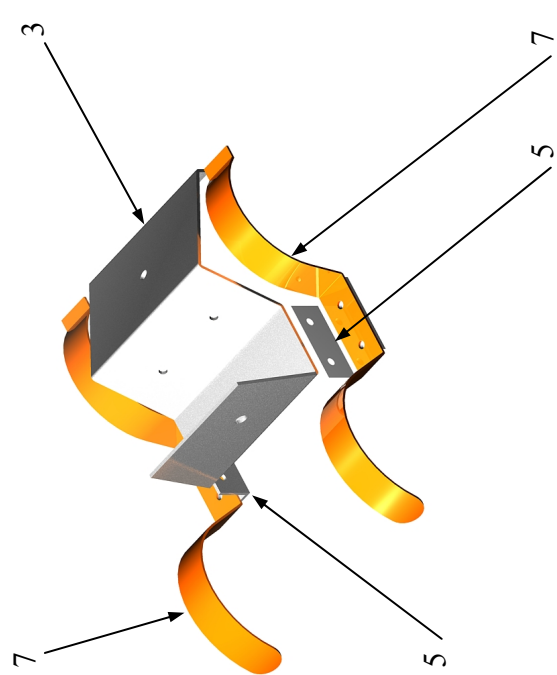
Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2014

Subjective Grading 1/5		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Mark	Marks		
Section	Part Number	Pictorial Sketch/Description					Concept	Mark	Marks	
1	Complete Model (Not including Design Element)	 <p>Assembly - Finish - Function</p>					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	<p>1. Design, make and attach <b>Front and Rear Bumpers</b> for the model. The existing holes may be used to attach the bumpers to the model.</p> <p>2. Design, make and attach a <b>Steering Wheel</b> for the model.</p>					Design <i>Bumpers</i> : Subjective Grade 1 – 5	5	20	
							Make	3		
							Attach	2		
							Design <i>Steering Wheel</i> : Subjective Grade 1 – 5	5		
							Make	3		
3	Parts 1, 4, & 8						Part 1 Bonnet	2	20	
							Part 4 Bonnet Side Panel × 2	6		2
								Part 8 Battery Holder Clamp		
							Mark Out			12
							Drill, Shape & Bend	10		10
							Mark Out	6		2
Drill & Shape	4	4								
Mark Out, Drill, Shape & Bend	2	2								




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

**Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2014**

<b>4</b>	<b>Parts 2 &amp; 6</b>		<b>Part 2</b> Chassis	14	Mark Out	2	<b>20</b>
				2	Drill	2	
5	<b>Parts 3, 5 &amp; 7</b>		<b>Part 6</b> Seat	6	Mark Out	2	
7				Drill, CSK, Shape & Bend	4		
<b>5</b>	<b>Parts 3, 5 &amp; 7</b>		<b>Part 3</b> Support Unit	8	Mark Out	2	<b>20</b>
				7	Drill, Shape & Bend	6	
<b>5</b>	<b>Parts 3, 5 &amp; 7</b>		<b>Part 5</b> Mudguard Support × 2	4	Mark Out, Drill, Shape & Bend	4	
				7	Mark Out	2	
<b>5</b>	<b>Parts 3, 5 &amp; 7</b>		<b>Part 7</b> Mudguard × 2	8	Mark Out	2	<b>6</b>
				7	Drill, Shape & Bend	6	

**100 Marks (× 3 = 300 Total)**