L-Università ta' Malta

MATSEC
Examinations Board

Marking Scheme

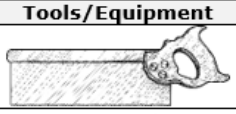
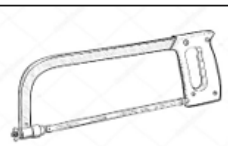
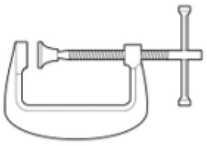
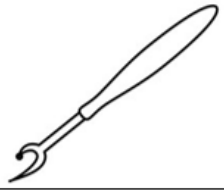
SEC Design & Technology

Main Session 2023

Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

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 the MATSEC Examinations Board when in doubt.

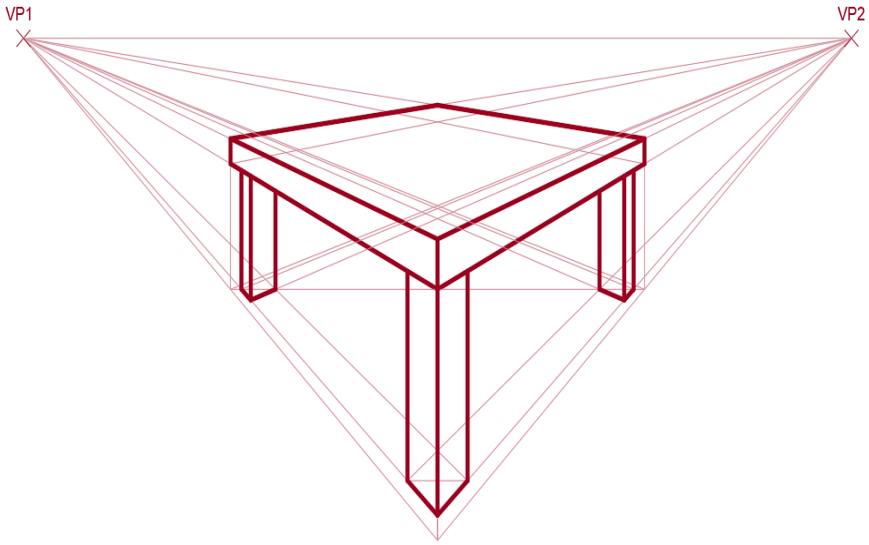
SECTION A: Core Design & Technology Principles

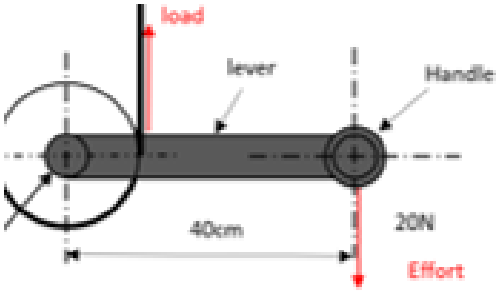
<table>
<tr><th colspan="2">QUESTION NUMBER</th><th>ANSWER</th><th>MARKS ALLOTTED</th></tr>
<tr><td rowspan="3">1</td><td>a</td><td>An individual or group that has an interest in any decision or activity of an organization. Accept other possible suitable answers.</td><td>1</td></tr>
<tr><td>b</td><td>Any 3 from: Designers, clients, manufacturers, users, personas. Accept other possible suitable answers.</td><td>3</td></tr>
<tr><td>c</td><td>Any 3 from: Presentations, charts, open days, notice boards and online platforms. Accept other possible suitable answers.</td><td>3</td></tr>
<tr><td>2</td><td></td><td>Walnut: Hardwood (1/2 mark); Pine: Softwood (1/2 mark)</td><td>1</td></tr>
<tr><td rowspan="2">3</td><td>a</td><td>
<table>
<tr><th>Tools/Equipment</th><th>Name</th><th>Use</th></tr>
<tr><td>  </td><td>Backsaw</td><td>Used to cut straight lines in thicker wood.</td></tr>
<tr><td>  </td><td>nail pincers</td><td>Used to easily pull-out nails from wood without damaging the surface.</td></tr>
<tr><td>  </td><td>hack saw</td><td>Are used to make straight cuts in metal or plastic. The blade is held tightly in the frame, with the teeth pointing forwards.</td></tr>
<tr><td>  </td><td>Screwdriver</td><td>A type of hand tool used for fastening and removing screws.</td></tr>
<tr><td>  </td><td>G- clamp</td><td>A device typically used to hold a wood or metal workpiece while one works.</td></tr>
<tr><td>  </td><td>Seam Ripper</td><td>Used to remove stitches, open seams, cut threads and open buttonholes.</td></tr>
</table>
‘Name’ answers ½ mark each
‘Use’ answers 1 mark each. Accept other possible suitable answers.
</td><td>6</td></tr>
<tr><td>b</td><td>Chuck and safety guard</td><td>1</td></tr>
<tr><td colspan="2">4</td><td>Any two of: Reuse, Reduce and Recycle (1/2 mark each)</td><td>1</td></tr>
<tr><td colspan="2">5</td><td>Any two of: Nylon, spandex, acrylic, polyester (1 mark each)</td><td>2</td></tr>
<tr><td colspan="2">6</td><td>Accept any 2 possible suitable answers referring to H&S lab rules.</td><td>2</td></tr>
</table>

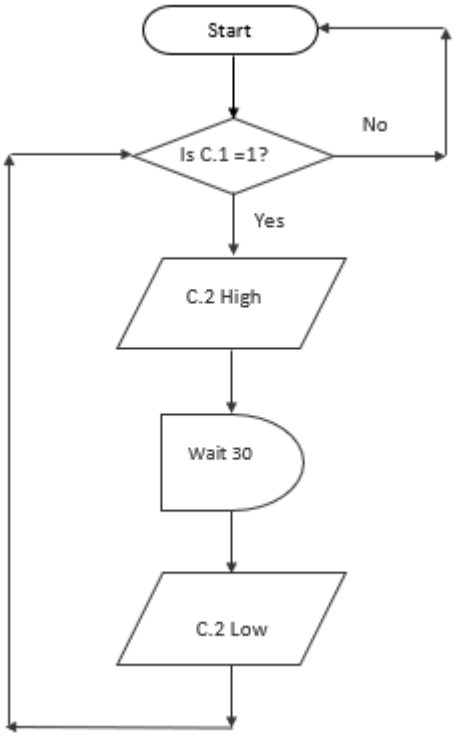
SECTION B: Design Aspect

QUESTION NUMBER		ANSWER	MARKS ALLOTTED
7	a	Specifications should be relevant to a kids' riding toy e.g. Safe, no sharp edges, avoid small pieces that can be swallowed by kids, colourful, attractive. Accept other relevant answers.	1 × 2 = 2
	b	Accept: Brainstorming, mind maps or similar relevant methods.	1
8	a	Award the following for each sketched idea: 1 mark idea relevance of idea to the brief, 1 mark clear design concepts/ clarity, 1 mark for proper annotations, 1 mark for realistic dimensions 1 mark for presentation and good use of colour Note that if the sketch does not satisfy the situation no marks are to be awarded.	5 × 2 = 10
	b	Accept advantages related to the chosen idea of the riding toy. Stating chosen Idea does not carry marks but award no marks if not stated.	1
9	a	Accept answers related to the chosen idea of the riding toy.	1 x 3 = 3
	b	Accept any two of the following answers: Detailed cutting lists, required equipment list, project work plan, working drawings, manufacturing procedures, finishing procedures, part assembly, gantt chart. Accept other relevant answers.	2
10	a	Accept any two of the following answers: Part testing, full product testing, usability tests. Accept other relevant answers.	2
	b	Award the following marks for each criterion below: 1 mark for clarity. 1 mark for presentation and good use of colour. 1 mark for considering unallowed use suitably. 1 mark for considering allowed use suitably. Note that if the sketch does not satisfy the question no marks are to be awarded.	4

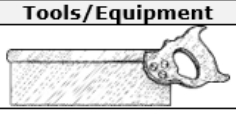
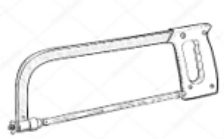
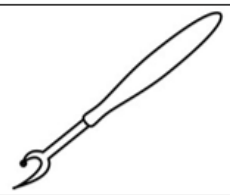
SECTION C: Technology Aspect

QUESTION NUMBER		ANSWER	MARKS ALLOTTED
11		Injection moulding	1
12	a	**Model answer:** Thermoplastics are polymers which can be heated and shaped many times. Thermoplastics will soften when it is heated and can be shaped when hot. The plastic will harden when cooled but can be reshaped because there is no links between the polymer chains. *Accept shorter relevant answers.*	1
	b	Any two of the following: ABS, PET, HIPS, PVC, PMMA (Acrylic). Accept other suitable correct answers.	½ x 2 = 1
	c	Translucent	1
	d	i. Red: Green ii. Yellow: Purple	2
13		 *Award 1 mark for correct perspective lines* *Award 2 marks for outlining the table clearly.*	3
14	a	A dense material will be heavy for its size therefore it will help keep the lamp steady as one adjusts it to his/her preferred position. Accept other relevant answers.	1
	b	The arms need to withstand forces thus the strength is required to make the arms taller and the lampshade more usable. Accept other relevant answers.	1
	c	Gives you the ability to adjust the lamp in any position that you want as the arms are not permanently joined together.	1
	d	i. Stainless steel bolts and nuts will be corrosion resistant and durable to work efficiently. ii. Aluminium for the shade will make it light weight for stability, reflective and corrosion resistant. *Accept other relevant answers. Deduct 1 mark if one of the properties is repeated.*	2

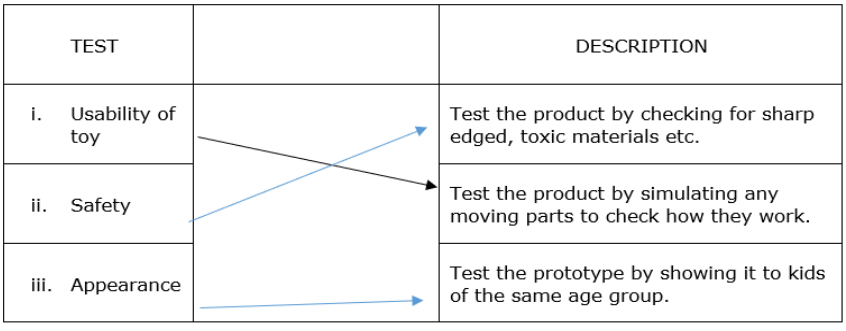
15	a	This type of manufactured wood is composed of several thin veneers which are joined together at right angles with adhesive.	2
	b	Coping Saw or Fret saw	1
	c	*Award a mark for any safety precaution mentioned related to the use of a belt sander. Examples of answers could be:* A person must wear safety glasses to protect their eyes from wood dust. A person must wear an apron to protect their clothes. A person must roll up their long sleeves. A person must tuck in ties and any loose clothing. Accept other suitable answers.	2
	d	*Award 2 marks for answers that are related to the application of a surface finish for functional reasons. Example:* To prevent or limit tarnishing of the surface so there will be no need for repetitive polishing. To increase surface wear and resistance. To make a surface waterproof. To prevent the material from being damaged degraded. To defend against attack from insects, fungus, etc. To make a product smooth.	2
16	a	2nd class lever. Accept only when reference to 2nd class is given.	1
	b	 *Award 1 mark for both correct arrows and 1 mark for both correct labels*	2
	c	Moment = Force x Distance 20N x 0.4m = 8Nm *Award 1 mark for using the correct formula and conversion from cm to m.* *1 mark for the correct unit (Nm).*	2
	d	i. .stl or .obj ii. Any suitable software package including named examples of CAD (e.g. Tinkercad ®) and slicers (e.g. Cura®).	2
17	a	Pulley and belt system	1
	b	The pulley has a groove, and the belt has more surface contact area with the pulley; the belt avoids slipping. *Accept other suitable answers.*	2
	c	*Award marks for arrow shown turning in a clockwise direction.*	1
	d	$$P = V \times I$$ $$I = \frac{P}{V}$$ $$I = \frac{200W}{24V}$$ $$I = 8.3A$$ 1 mark for working, 1 mark for correct answer. *Deduct ½mark for incorrect or missing units.*	2

18	a	Switch SW1, Resistor R1	1
	b	Push to make switch, micro switch	1
	c	Mark with an X where power supply is broken	1
	d	Brown, Black, and Orange	3
	e	Motor, relay	1
	f	i. Anode on left side, Cathode on right side ii. Semi-conductor iii. The diode is protecting the circuit from back EMF	1 x 3 = 3
	g	1.5V + 1.5V + 1.5V = 4.5 V *Award 1 mark for using the appropriate formula. Award 1 mark for good values and units used*	2
19	a	Multi-meter, Voltmeter	1
	b	In parallel to the component	1
20	a	*Award 1 mark for examples like fumes whilst soldering. projectiles during trimming of component leads, etc.*	1
	b	Consider answers which include precautions like wearing PPE like goggles, masks etc; Ventilation and good light conditions. Accept other suitable correct answers.	2
21		*Award 2 marks for correct sequence of looped commands. Award 1 mark for condition.* *Award 1 mark for looping the whole program.* *Award 1 mark for correct use of arrows.* *Answer should be laid out as follows or similar suitable answer.* 	5

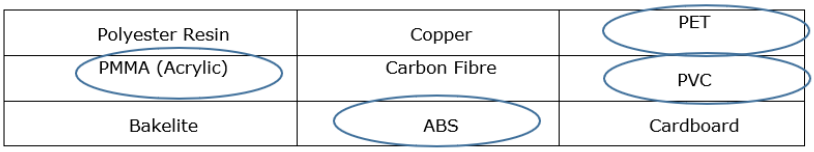
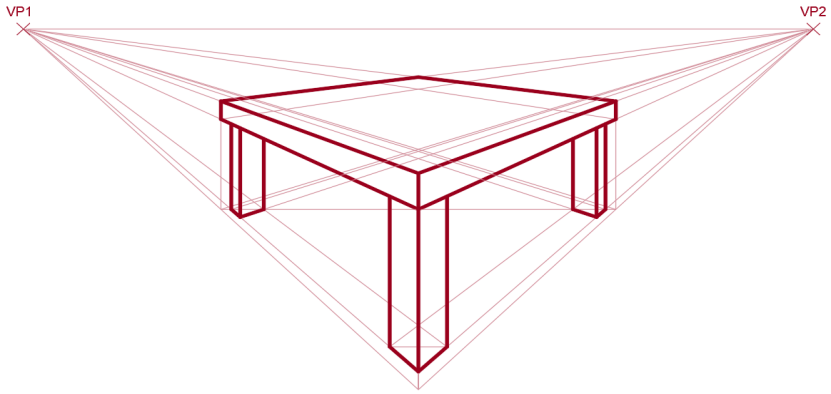
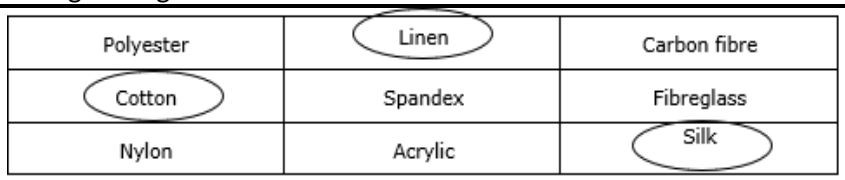
SECTION A: Core Design & Technology Principles

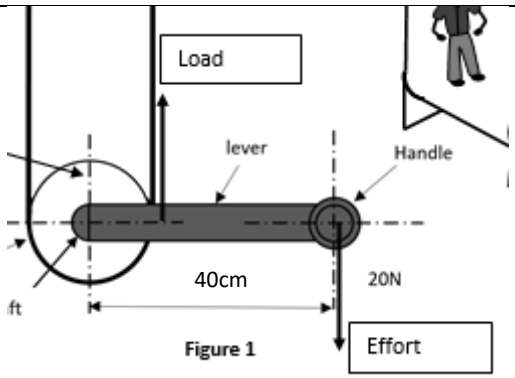
<table>
<tr><th colspan="2">QUESTION NUMBER</th><th>ANSWER</th><th>MARKS ALLOTTED</th></tr>
<tr><td rowspan="3">1</td><td>a</td><td>An individual or group that has an interest in any decision or activity of an organization. Accept other possible suitable answers.</td><td>1</td></tr>
<tr><td>b</td><td>Any 3 from: Designers, clients, manufacturers, users, personas. Accept other possible suitable answers.</td><td>3</td></tr>
<tr><td>c</td><td>Any 3 from: Presentations, charts, open days, notice boards and online platforms. Accept other possible suitable answers.</td><td>3</td></tr>
<tr><td colspan="2">2</td><td>Walnut: Hardwood (1/2 mark); Pine: Softwood (1/2 mark)</td><td>1</td></tr>
<tr><td rowspan="2">3</td><td>a</td><td>
<table>
<tr><th>Tools/Equipment</th><th>Name</th><th>Use</th></tr>
<tr><td>  </td><td>Backsaw</td><td>Used to cut straight lines in thicker wood.</td></tr>
<tr><td>  </td><td>nail pincers</td><td>Used to easily pull-out nails from wood without damaging the surface.</td></tr>
<tr><td>  </td><td>hack saw</td><td>Are used to make straight cuts in metal or plastic. The blade is held tightly in the frame, with the teeth pointing forwards.</td></tr>
<tr><td>  </td><td>Screwdriver</td><td>A type of hand tool used for fastening and removing screws.</td></tr>
<tr><td>  </td><td>G- clamp</td><td>A device typically used to hold a wood or metal workpiece while one works.</td></tr>
<tr><td>  </td><td>Seam Ripper</td><td>Used to remove stitches, open seams, cut threads and open buttonholes.</td></tr>
</table>
‘Name’ answers ½ mark each
‘Use’ answers 1 mark each. Accept other possible suitable answers.
</td><td>6</td></tr>
<tr><td>b</td><td>iii. Chuck and safety guard</td><td>1</td></tr>
<tr><td colspan="2">4</td><td>Any two of: Reuse, Reduce and Recycle (1/2 mark each)</td><td>1</td></tr>
<tr><td colspan="2">5</td><td>Any two of: Nylon, spandex, acrylic, polyester (1 mark each)</td><td>2</td></tr>
<tr><td colspan="2">6</td><td>Accept any 2 possible suitable answers referring to H&S lab rules.</td><td>2</td></tr>
</table>

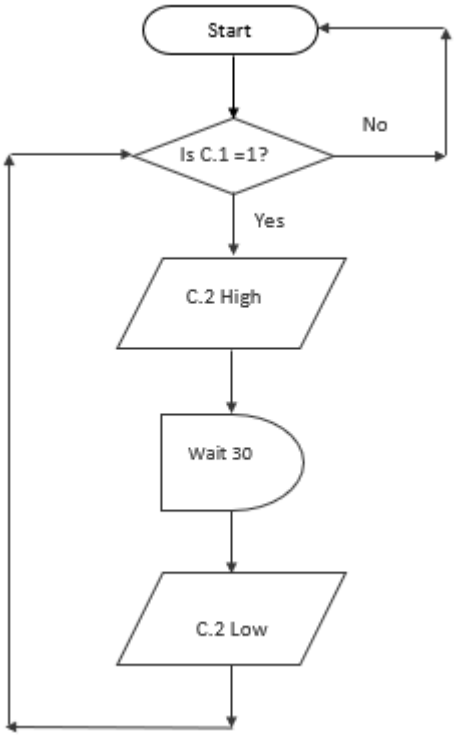
SECTION B: Design Aspect

<table>
<tr><th colspan="2">QUESTION NUMBER</th><th>ANSWER</th><th>MARKS ALLOTTED</th></tr>
<tr><td rowspan="3">7</td><td>a</td><td>Accept any 2 of the following: shopping mall, Riding toy, kids / 3-5 yr old kids, play area.</td><td>1</td></tr>
<tr><td>b</td><td>Award the following for each sketched idea:
1 mark idea relevance of idea to the brief,
1 mark clear design concepts / clarity,
1 mark for proper annotations,
1 mark for realistic dimensions
1 mark for presentation and good use of colour
Note that if the sketch does not satisfy the situation no marks are to be awarded.</td><td>5 × 2 = 10</td></tr>
<tr><td>c</td><td>Award 2 marks for correctly filling each column with ticks that relate the designs suggested, Award 1 mark for chosen idea being a reflection of the higher positive ticks. Consider equal ticks as also suitable if these are justified.</td><td>3</td></tr>
<tr><td rowspan="2">8</td><td>a</td><td>Accept answers related to the chosen idea of the riding toy.
Award 1 mark for a suitable Input part or action
Award 1 mark for a suitable process part or action
Award 1 mark for a suitable output part or action</td><td>1 x 3 = 3</td></tr>
<tr><td>b</td><td>Accept any two of the following answers: Detailed cutting lists, required equipment list, project work plan, working drawings, manufacturing procedures, finishing procedures, part assembly, gantt chart. Accept other relevant answers.</td><td>2</td></tr>
<tr><td colspan="2">9</td><td> 
</td><td>2</td></tr>
<tr><td rowspan="2">10</td><td>a</td><td>Award the following marks for each criterion below:
2 mark for clarity of instruction.
1 mark for presentation and good use of colour.
Note that if the sketch does not satisfy the instructions given, no marks are to be awarded.</td><td>3</td></tr>
<tr><td>b</td><td>Precaution should relate to proposed idea suitably.</td><td>1</td></tr>
</table>

SECTION C: Technology Aspect

QUESTION NUMBER		ANSWER	MARKS ALLOTTED
11		Injection moulding	1
12	a	Thermoplastics are polymers which can be heated and shaped many times	1
	b		2
	c	Transparent	1
13		 Award 1 mark for correct perspective lines Award 2 marks for outlining the table clearly.	3
14		Warm: Red, Yellow, Orange; Cold: Blue Green, Violet	3
15	a	Walnut: Hardwood; Pine: Softwood	1
	b	i. How heavy the material is in comparison to its size. ii. The ability to withstand a pulling force (tension) without breaking or bending.	1 x 2 = 2
	c	Gives you the ability to adjust the lamp in any position that you want as the arms are not permanently joined together.	1
	d	iii. is corrosion resistant iv. light weight	1 x 2 = 2
16			2
17	a	Plywood	1
	b	Coping saw	1
	c	Award a mark for any safety precaution mentioned related to the use of a belt sander. Examples of answers could be: A person must wear safety glasses to protect their eyes from wood dust. A person must wear an apron to protect their clothes. A person must roll up their long sleeves. A person must tuck in ties and any loose clothing.	1
	d	Paint, wax, varnish, French polish are all acceptable answers	1

18	a	2nd class lever	1
	b	 Figure 1	1
	c	Moments = Force x Distance 20N x 0.4m = 8Nm 2 marks for using the correct formula 1 mark for the correct unit (Nm)	3
	d	iii. .STL iv. Any suitable software package including named examples of CAD (e.g. Tinkercad ®) and slicers (e.g. cura®).	2
19	a	Pulley and belt system	1
	b	Belt	1
	c	Award 1 mark for clockwise/anti-clockwise turning arrow	1
	d	Power = voltage x Current, 24V x 10A = 240 Watts Award 1 mark for correct formula used, 1 mark for values and 1 mark for units in answer	3
20	a	Award 1 mark for outlining the left part of the circuit, resistor, switch and power supply.	1
	b	Micro switch	1
	c	X should be marked on any wire location that stops continuity to the circuit, including the IC supply line.	1
	d	Brown, Black, and Orange	3
	e	i. Anode on left side, cathode on right side ii. Semi-conductor iii. ‘protect’	3
	f	Motor, relay	1
	g	Award 1 mark for using the appropriate formula. Award 1 mark for good values and units used: 1.5v + 1.5v + 1.5v = 4.5 Volts	2
	h	Continuity, Measure component’s parameters: Voltage, Current, resistance	1
	i	Award 1 mark for examples like fumes whilst soldering. projectiles during trimming of component leads, burns, etc.	1

21		Award 2 marks for correct sequence of looped commands. Award 1 mark for satisfying the condition required. Award 1 mark for looping the whole program. Award 1 mark for correct use of arrows. Answer should be laid out as follows or similar suitable answer.  	5