



National  
Qualifications  
2015

## 2015 Design and Manufacture

### National 5

## Finalised Marking Instructions

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## General Marking Principles for National 5 Design and Manufacture

*This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.*

- (a) Marks for each candidate response must always be assigned in line with these General Marking Principles and the specific Marking Instructions for the relevant question.
- (b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.
- (c) If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader.
- (d) Mark consecutive responses to match the marks available in 'state,' 'give' and 'write' questions, eg if two responses are given to a one mark question mark only the first response. Questions where candidates are asked to 'explain' or 'describe' should be marked in a more holistic manner.
- (e) Repetition of answers across different question parts is acceptable unless specifically stated otherwise in the question.

## Detailed Marking Instructions for each question

### Section 1

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(a)	(i)	Statement of suitable equipment: <ul style="list-style-type: none"> <li>• Held securely in a bench vice</li> <li>• Quick release clamps</li> <li>• 'F' clamps</li> <li>• 'G' clamps</li> <li>• Sash cramps/clamps</li> <li>• Bag press</li> <li>• Band clamp</li> <li>• Hand clamp</li> <li>• <b>Any other suitable response</b></li> </ul>	1	One mark for correct response. 'Clamp/clamping' scores zero marks.  The response 'vice' scores zero marks.
		(ii)	A description that includes two of the following points: <ul style="list-style-type: none"> <li>• The possible destruction of natural hardwoods (deforestation)</li> <li>• Speed of growth (quick or slow)</li> <li>• Pollution resulting from transporting hardwoods from tropical regions/less pollution from local sources</li> <li>• Hardwood dust being produced during the shaping processes</li> <li>• Hardwoods have a longer lifespan</li> <li>• Sourced from sustainable forest/farmed hardwood forest</li> <li>• Animals lose their home</li> <li>• Hardwoods can be recycled</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for each correct response up to a maximum of two marks.

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(b) (i)	<p>A description that includes two of the following stages with reference to the appropriate tools:</p> <ul style="list-style-type: none"> <li>• Measure/mark the centre line</li> <li>• Measure/mark the four lines for holes</li> <li>• Marking the hole centres</li> <li>• Measure with a rule</li> <li>• Mark with a scribe</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>Each stage should be marked holistically up to a total of one mark per stage.</p> <p>Woodworking tools score zero marks.</p> <p>If candidates describe processes without naming tools they score a maximum of one mark.</p> <p>Candidates must state a minimum of one tool (eg ruler/ rule/steel ruler) and two stages to gain two marks.</p> <p>Lists of tools score zero marks eg 'use a ruler and centre punch'.</p> <p>'Mark with a steel rule' scores zero marks.</p>
	(ii)	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> <li>• Secure metal/clamp metal/put metal in vice</li> <li>• Cut small chamfer</li> <li>• Guillotine corners off</li> <li>• File surface into rounded shape</li> <li>• Cross file</li> <li>• Draw file</li> <li>• De-burr</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>No marks awarded for marking out or finishing processes.</p>
	(iii)	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> <li>• Secure metal/clamp metal/put metal in vice</li> <li>• Heat the metal to make it easier to bend</li> <li>• Beat/bend with appropriate tool</li> <li>• Jigs/former</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>No marks awarded for marking out or finishing processes.</p> <p>'Bend it' on its own scores zero marks as it is a repeat of the question.</p> <p>Where templates are mentioned candidates must make reference to checking against rather than forming around.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(iv)	<p>A description that includes one of the following:</p> <ul style="list-style-type: none"> <li>• Use of a jig</li> <li>• Use of a former</li> <li>• Use of a template</li> <li>• A bending machine/box folder</li> <li>• Gabro set to angle</li> <li>• Blanking and pressing</li> <li>• A CNC bending machine</li> <li>• Sand casting</li> <li>• <b>Any other suitable response</b></li> </ul>	1	<p>One mark for correct response.</p> <p>Reference to suitable industrial processes may attract marks.</p> <p>'CAM,' 'CNC' or 'CNC Machine' on their own score zero marks.</p> <p>'Die casting' scores zero marks (the melting point of mild steel is too high).</p> <p>Sand casting is accepted. It is unlikely that this product would be cast but it is possible.</p>
	(v)	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> <li>• Cross file</li> <li>• Draw file</li> <li>• Abrasive paper/block</li> <li>• Remove grease/remove blue</li> <li>• Apply a primer/base/under coat</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>A maximum of one mark should be awarded for repeat processes such as 'rough file' and 'smooth file'.</p>
(c)	(i)	<p>State any two of the following:</p> <ul style="list-style-type: none"> <li>• Available as transparent/translucent</li> <li>• Readily available</li> <li>• Available in different colours</li> <li>• Easy to bend or shape</li> <li>• Easy to reform</li> <li>• Easy to drill</li> <li>• Easy to use</li> <li>• Easy to cut</li> <li>• Light weight</li> <li>• Strong</li> <li>• Durable</li> <li>• No finish required</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct property up to a maximum of two marks.</p> <p>Economic reasons score zero marks.</p> <p>Reference to a heating process prior to bending is not required. Eg if the candidate response states 'easy to bend' this would score one mark.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(ii)	<p>A description that includes two of the following stages:</p> <p><b>Heating stage:</b></p> <ul style="list-style-type: none"> <li>• Heat the acrylic until it softens</li> </ul> <p><b>Forming stage:</b></p> <ul style="list-style-type: none"> <li>• Bend it around a former/jig</li> <li>• Clamp and allow to cool</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>Where candidates state 'strip heater' as equipment to heat this should be accepted.</p> <p>'Heat it and cool it' scores one mark.</p> <p>'Bend it' on its own scores zero marks.</p> <p>Where templates are mentioned candidates must make reference to checking against rather than forming around.</p>
(d)	(i)	<p>A description that includes three of the following stages:</p> <ul style="list-style-type: none"> <li>• Mark centre (diagonals) on one end</li> <li>• Punch a hole in the centre</li> <li>• Mark a line (diagonal) on other end</li> <li>• Saw down the line</li> <li>• Secure blank in vice</li> <li>• Plane corners down/take corners off</li> <li>• <b>Any other suitable response</b></li> </ul>	3	<p>One mark for each correct stage up to a maximum of three marks.</p> <p>Sketched answers clearly showing three stages can gain full marks.</p> <p>Punching hole in centre can be done with centre punch, scribe, hole punch, bradawl, drill etc.</p> <p>No marks awarded for cutting blank to length.</p>
	(ii)	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> <li>• Remove/move tool rest</li> <li>• Speed machine up</li> <li>• Slow final cut/slow feed speed</li> <li>• Use abrasive paper/sand it</li> <li>• Use steel wool</li> <li>• Use shavings (burnishing)</li> <li>• Raise the grain</li> <li>• Apply finish</li> <li>• Sharpen the tool</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct stage up to a maximum of two marks.</p> <p>'Use rough sand paper and then use smooth sand paper' scores one mark.</p> <p>'Change lathe speed' scores zero marks.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(e)	Describe any two of the following: <ul style="list-style-type: none"> <li>• Increased use of bright colours</li> <li>• Surface features such as stickers/decals/theme</li> <li>• Added sound effect</li> <li>• Add modern technology</li> <li>• Moving parts</li> <li>• Advertising</li> <li>• <b>Any other suitable response</b></li> </ul>	<b>2</b>	One mark for each suitable response up to a maximum of two marks.
	(f)	A statement of a benefit to the environment: <ul style="list-style-type: none"> <li>• Less raw material usage</li> <li>• Less landfill use</li> <li>• Less energy used to manufacture replacements</li> <li>• Recyclable parts remain in use longer</li> <li>• Animal habitat not affected</li> <li>• <b>Any other suitable response</b></li> </ul>	<b>1</b>	One mark for correct response.
		<b>Total marks</b>	<b>24</b>	

Section 2

Question			Expected Answer(s)	Max Mark	Additional Guidance
2.	(a)	(i)	<p>Statement of suitable benefit:</p> <ul style="list-style-type: none"> <li>• Available in large sheets/wide sheets</li> <li>• Readily available</li> <li>• Stable in varying temperatures/ does not warp/twist/bow like timber</li> <li>• Cheap/inexpensive/tends to be less expensive than solid timber</li> <li>• Smooth surface/textured surface/flat surface/good surface for achieving a smooth finish</li> <li>• Strong/strong in both/all directions/cross grained</li> <li>• Hard wearing/durable</li> <li>• Uniform thickness/even textured</li> <li>• Light weight (in context of clock)</li> <li>• Easy to use (in context of clock)</li> <li>• <b>Any other suitable response</b></li> </ul>	1	<p>One mark for correct response.</p> <p><b>Typical Response:</b></p> <p>‘Plywood does not warp or twist.’ Clear response which scores one mark.</p> <p>‘Looks more appealing’ scores one mark. This shows understanding of sales increase.</p>
		(ii)	<p>Statement of suitable method:</p> <ul style="list-style-type: none"> <li>• CNC router</li> <li>• CNC machining</li> <li>• Laser cutting</li> <li>• High pressure water jet cutting</li> <li>• <b>Any other suitable response</b></li> </ul>	1	<p>One mark for correct response.</p> <p>Generic terms such as ‘Sawing, Machines’ or ‘CNC” score zero marks.</p> <p>Vague references to factory, mass manufacturing or robots score zero marks.</p> <p>References to CAD score zero marks.</p> <p><b>Typical Response:</b></p> <p>‘A CNC Router could cut these shapes.’ Clear response which scores one mark.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(iii)	<p>A description that includes two of the following benefits:</p> <ul style="list-style-type: none"> <li>• Quick</li> <li>• Identical products</li> <li>• Intricate detail</li> <li>• Smooth edges/good finish</li> <li>• Accurate</li> <li>• Shorter lead times</li> <li>• Cheap/inexpensive</li> <li>• Reduced labour costs</li> <li>• 24/7 production</li> <li>• Unskilled workforce</li> <li>• Nesting to reduce waste</li> <li>• <b>Any other suitable response</b></li> </ul>	<b>2</b>	<p>One mark for each correct response up to a maximum of two marks.</p> <p>No marks can be awarded for CAD benefits.</p>
	(b)	<p>An explanation that includes two of the following issues:</p> <ul style="list-style-type: none"> <li>• Manufacturer error leading to missing components/missing components</li> <li>• After sales customer care</li> <li>• Standard of raw material</li> <li>• Clear instructions</li> <li>• Some level of skill is required to assemble the kit</li> <li>• Having the correct tools to assemble</li> <li>• Guarantee</li> <li>• Quality of standard components</li> <li>• Checking the kit is not damaged in transit</li> <li>• <b>Any other suitable response</b></li> </ul>	<b>2</b>	<p>One mark for each correct response up to a maximum of two marks.</p>
<b>Total marks</b>			<b>6</b>	

Question			Expected Answer(s)	Max Mark	Additional Guidance
3.	(a)	(i)	State any two of the following: <ul style="list-style-type: none"> <li>• Morphological analysis</li> <li>• Technology transfer</li> <li>• Analogy</li> <li>• Design stories</li> <li>• Lifestyle boards</li> <li>• Mood boards/mood rooms</li> <li>• Brainstorming/thought shower</li> <li>• Researching or looking at existing products</li> <li>• Lateral thinking</li> <li>• SAM(Subtract, Add, Manipulate)/SCAMPER</li> <li>• Take your pencil for a walk</li> <li>• Survey/questionnaire/market research</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for each correct response up to a maximum of two marks.  'Mind map' scores zero marks. It is an organisational tool used during the analysis stage.
		(ii)	A clear description of an idea generation activity attracts two marks.	2	One mark for each correct response up to a maximum of two marks.  A correct description of a technique that has <b>not</b> been stated can gain full marks.
	(b)	(i)	State any one of the following graphic techniques: <ul style="list-style-type: none"> <li>• Sketches</li> <li>• Sectional views</li> <li>• Construction details</li> <li>• CAD</li> <li>• Orthographic/dimensioned drawing</li> <li>• Exploded views</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for correct graphic technique and one mark for explanation.

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(ii)	State any one of the following graphic techniques: <ul style="list-style-type: none"> <li>• Presentation drawing</li> <li>• 3D solid model/CAD model/ Inventor (any modelling package)</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for correct graphic technique and one mark for explanation.  ‘Modelling’ on its own does not imply a graphic technique and scores zero marks
(c)	(i)	State any two of the following: <ul style="list-style-type: none"> <li>• To create/develop new ideas</li> <li>• To see it in 3D</li> <li>• To test design factors*</li> <li>• To show it to the client/other designers</li> <li>• To determine manufacturing/ construction processes</li> <li>• To show a focus group to increase market share</li> <li>• Quick/easy to make</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for each correct reason up to a total of two marks.  *Candidates may refer to more than one design factor whilst commenting on the dish brush. This will attract two marks.  <b>Typical responses:</b> ‘The handle of the dish brush was modelled to test ergonomics’ scores one mark.  ‘The handle of the dish brush was modelled to show its shape’ scores one mark.  ‘To see if you can make it better’ is sufficient for one mark as it implies the testing of design factors.
	(ii)	State any one of the following: <ul style="list-style-type: none"> <li>• Wood</li> <li>• Foam</li> <li>• Clay</li> <li>• Modelling compound</li> <li>• Balsa Wood</li> <li>• Expanded Foam</li> <li>• Polymorph</li> <li>• Polystyrene</li> <li>• Smart modelling material</li> <li>• <b>Any other suitable response</b></li> </ul>	1	One mark for correct response.  Candidates may refer to other simple modelling materials such as wire and paper. Marks can only be awarded here when the candidate clearly describes how the suggested material could be used to model the brush handle.  Reference to polystyrene is an accepted response. No reference to ‘expanded’ is required.
<b>Total marks</b>			<b>11</b>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
4.	(a)	<p>Candidates should describe the following broad areas of aesthetics.</p> <ul style="list-style-type: none"> <li>• Shape</li> <li>• Colour</li> <li>• Form</li> <li>• Texture</li> <li>• Material</li> <li>• Line</li> <li>• Proportion</li> <li>• Balance</li> <li>• Symmetry</li> <li>• Fashion/style/fad</li> <li>• Contrast</li> <li>• <b>Any other suitable response</b></li> </ul>	3	<p>One mark for each correct description up to total of three marks</p> <p>To gain one mark candidates should refer to one of the broad areas and link it to one, two or all of the headphones.</p> <p>Examples:</p> <p>The red and silver colours <b>contrast</b> each other on Headphones C. (One mark).</p> <p>The square <b>shape</b> of Headphones A looks very modern. (One mark).</p> <p>The square <b>shape</b> of Headphones A <b>contrasts</b> with the round <b>shape</b> of Headphones B. (Two marks).</p> <p>A degree of professional judgement may be required to decipher between psychological and aesthetic responses:</p> <p>The padded headphone looks comfortable. (Zero marks)</p> <p>‘Eye catching’ on its own scores zero marks. This is not an aesthetic term.</p>
	(b)	<p>A description that includes two of the following:</p> <ul style="list-style-type: none"> <li>• Headband fits round head/ sized to fit human head</li> <li>• It is adjustable to fit a range of users’ head sizes</li> <li>• Button sized correctly for finger</li> <li>• <b>Any other suitable response</b></li> </ul>	2	<p>One mark for each correct response up to a total of two marks.</p> <p>To gain marks, candidates must <b>describe the relationship</b> between the anthropometric consideration and all, or a part of, the headphones.</p> <p>No marks for noting percentiles only, eg ‘95<sup>th</sup> percentile’ on its own scores zero marks.</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(c)	Any two of the following statements: <ul style="list-style-type: none"> <li>• More flexibility for the user/ increased mobility during use</li> <li>• Easier to tidy away or store</li> <li>• No tangle of wires to sort out</li> <li>• <b>Any other suitable response</b></li> </ul>	<b>2</b>	One mark for each correct benefit up to a total of two marks.
		<b>Total marks</b>	<b>7</b>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
5.	(a)	<p>A description that refers to one of the following:</p> <ul style="list-style-type: none"> <li>• User trial/trip</li> <li>• Testing</li> <li>• Survey</li> <li>• <b>Any other suitable response</b></li> </ul> <p>Any combination of the statements below would score two marks:</p> <ol style="list-style-type: none"> <li>1. Hand out the product to a range of users</li> <li>2. Carry out activity</li> <li>3. Report back on results</li> </ol>	2	<p>One mark for each correct response up to a total of two marks.</p> <p>Candidates must describe the evaluation method and link it to the scooter to gain full marks.</p> <p>‘Use it’ scores zero marks. ‘Test it’ scores zero marks. ‘Drop test’ scores one mark.</p> <p>Example responses: The market researcher could take the scooter outside and test it on different surfaces. (Two marks).</p> <p>The scooter could be repeatedly dropped from a height of 1 m. The market researcher would then assess the damage. (Two marks).</p>
	(b)	<p>A description that refers to one of the following:</p> <ul style="list-style-type: none"> <li>• Product comparison (this term scores one mark on its own)</li> <li>• User trial/trip</li> <li>• Survey</li> <li>• <b>Any other suitable response</b></li> </ul> <p>For survey/questionnaire responses, any combination of the statements below would score two marks:</p> <ol style="list-style-type: none"> <li>1. Hand out the product to a range of users</li> <li>2. Carry out activity</li> <li>3. Report back on results</li> </ol>	2	<p>One mark for correct description up to a total of two marks.</p> <p>Candidates must describe the evaluation method and link it to the scooter to gain full marks.</p> <p>‘Find out the price of other scooters’ scores one mark.</p> <p>‘Compare the price to other scooters’ scores one mark.</p> <p>‘Find out the price of other scooters and compare these’ scores two marks.</p> <p>Post purchase evaluations are acceptable.</p> <p>Example responses:</p> <p>Comparison to other products. The market researcher could go online and look at the cost of similar scooters. (Two marks).</p> <p>Survey. The market researcher could ask members of the public how much they would be willing to pay for the scooter. (Two marks).</p>

Question		Expected Answer(s)	Max Mark	Additional Guidance
	(c)	(i)	1	<p>One mark for correct response</p> <p>Responses in the form of a question are accepted where understanding of functional requirements are shown.</p> <p>'It must balance' is too vague and scores zero marks.</p>
		(ii)	1	<p>One mark for correct response</p> <p>Responses in the form of a question are accepted where understanding of maintenance issues are shown.</p>
	(d)	(i)	1	<p>One mark awarded for a description of the role of an engineer.</p> <p>'Makes the product' scores one mark.</p> <p>Candidates may refer to the scooter. However, this question does not specifically ask them to do so.</p>
		(ii)	1	<p>One mark awarded for a description of the role of an accountant.</p> <p>Typical minimum response: 'The accountant is in charge of the money' scores one mark.</p> <p>Candidates may refer to the scooter. However, this question does not specifically ask them to do so.</p>
			<b>8</b>	

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	(a)	State any two of the following: <ul style="list-style-type: none"> <li>• Purchase of machinery</li> <li>• Associated computer hardware costs</li> <li>• Manufacture of mould/tooling</li> <li>• Training of workforce</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark awarded for each correct response up to a total of two marks.  <b>No description required.</b>  Responses relating to materials as set-up costs can only score marks where candidates have clearly indicated an initial bulk purchase of raw materials.  Running costs score zero marks eg buying plastic, electricity etc.
	(b)	State any two of the following: <ul style="list-style-type: none"> <li>• Injection point or mark</li> <li>• Sprue mark</li> <li>• Ejector pin marks/round indents where it has been pushed out the machine</li> <li>• Tapered edges/draft angles</li> <li>• Complex shapes</li> <li>• Mould split lines/lines where the mould has joined or separated</li> <li>• Shrinkage/sink marks</li> <li>• Flash</li> <li>• Webs</li> <li>• Single part</li> <li>• <b>Any other suitable response</b></li> </ul>	2	One mark for correct response up to a total of two marks.  'Made from plastic/inbuilt colour/CAM' scores zero marks.  Typical response: 'The injection point on the plastic' scores one mark.
<b>Total marks</b>			<b>4</b>	

[END OF MARKING INSTRUCTIONS]