

FOR OFFICIAL USE



National
Qualifications
2014

Mark

X719/75/01

Design and Manufacture

TUESDAY, 27 MAY

1:00 PM – 2:30 PM



* X 7 1 9 7 5 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 60

SECTION 1 — 24 marks

Attempt ALL questions.

SECTION 2 — 36 marks

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



* X 7 1 9 7 5 0 1 0 1 *

SECTION 1 — 24 marks

Attempt ALL questions

1. A chess box is shown below.



(a) Hardwood was used for some of the squares of the chess board.

(i) State the name of a hardwood that could have been used for the squares. 1

(ii) Describe **two** benefits of using hardwoods for the manufacture of this product. 2

(b) A comb joint has been used at each corner.

State the name of **two** alternative joints that could have been used at each corner. 2

(c) Clear varnish was used as a surface finish for the chess box.

(i) Describe **two** benefits of using clear varnish as a surface finish for the chess box. 2



1. (c) (continued)

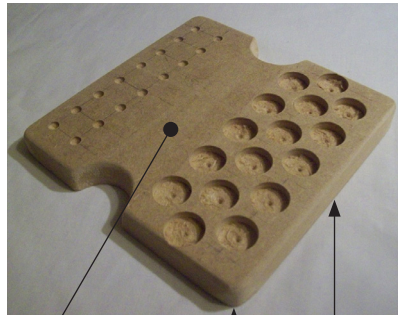
- (ii) Describe **two** stages in the preparation of the wood before applying the varnish.

2

The plastic tray shown below was vacuum formed and is used to hold the chess pieces. The wooden pattern used in the process is also shown.



Plastic tray



Wooden Pattern

Sloping side

Rounded corner

- (d) Explain the reason for the following features in the wooden pattern.

- (i) Rounded corners _____ 1

- (ii) Sloping sides _____ 1

- (iii) A thermoplastic was used for the tray.

Describe **two** benefits of using a thermoplastic for this type of product.

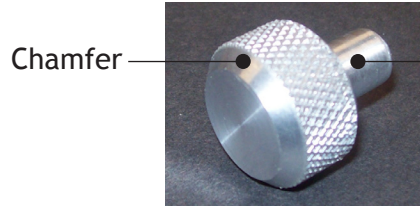
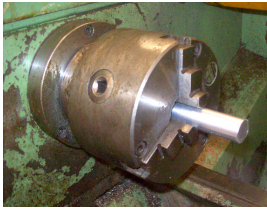
2

[Turn over



1. (continued)

(e) The aluminium handle shown below was manufactured using a centre lathe.



Chamfer

Parallel
Turned
Dowel

Describe how **each** of the following processes would be carried out on the centre lathe to manufacture the handle.

(i) Chamfering

2

(ii) Parallel turning

2

(iii) A change of speed may be required when using a centre lathe.

State **two** reasons why a change in lathe speed may be necessary.

2

1. (continued)

- (f) The aluminium chess pieces shown below were commercially produced by the process of die casting.



- (i) State **two** reasons for using aluminium for the chess pieces. 2

- (ii) State **three** benefits of using die casting to manufacture the chess pieces. 3

Total marks 24

[Turn over



SECTION 2 — 36 marks

Attempt ALL questions

2. The 2012 Olympic success of Team GB caused an increased interest in all forms of cycling for all ages.



- (a) Describe how ergonomics has influenced the design of bicycles.

6



* X 7 1 9 7 5 0 1 0 6 *

2. (continued)

- (b) Before producing a design specification for a bicycle, the designer would have researched various design factors.

Explain why the following design factors would be researched when designing bicycles.

- (i) Durability

1

- (ii) Ease of maintenance

1

- (iii) Aesthetics

1

Total marks 9

[Turn over



3. The environmental impact of a product can often influence our buying decisions.

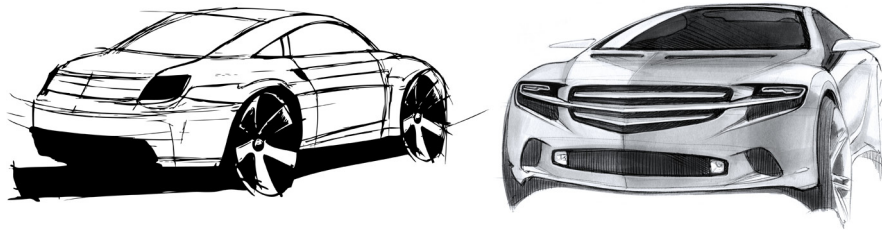


Explain ways in which designers could reduce the environmental impact of their products.

(You may wish to refer to products with which you are familiar.)

3

4. Designers use a range of graphic techniques to communicate their designs.



(a) State the name of **one** graphic technique that the designer may use at each of the following stages of the design process and explain why it would be suitable.

(A different graphic technique must be used for each stage.)

(i) Initial ideas

2

(ii) Planning for manufacture

2

[Turn over



* X 7 1 9 7 5 0 1 0 9 *

MARKS

DO NOT
WRITE
IN THIS
MARGIN

4. (continued)

(b) Designers often use models as well as a range of graphic techniques.

State the name of **two** modelling materials and explain why each would be suitable for building models.

(A different explanation must be given for each material.)

4

Total marks 8



* X 7 1 9 7 5 0 1 1 0 *

5. A stainless steel colander is shown below.



- (a) (i) Give **two** reasons why stainless steel would be suitable for the colander.

2

- (ii) The colander was mass produced.

Describe **two** benefits to the manufacturer of mass production techniques.

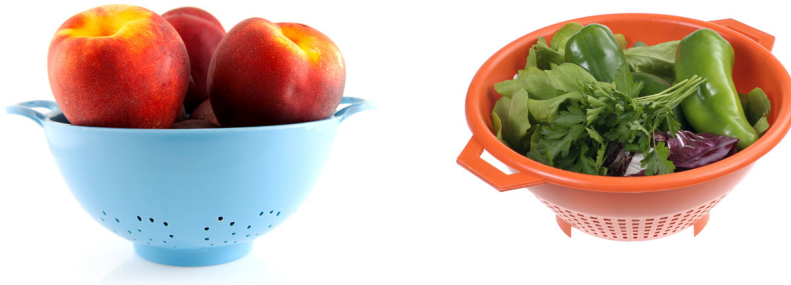
2

[Turn over



5. (continued)

(b) Colanders can also be manufactured from plastic as shown below.



State the name of a suitable process for manufacturing colanders from plastic.

1

(c) Manufacturers are increasingly using CNC and CAD/CAM technologies to make their products.

Describe the impact that these technologies have on the manufacturer.

3

Total marks 8

6. An electric razor is shown below.



The manufacturer wishes to carry out an evaluation of the razor.

- (a) Describe a suitable user trial to evaluate the ergonomics of the razor. 2

- (b) State **two** key questions that would be included in a survey to evaluate the aesthetics of the razor. 2

[Turn over for Question 6 (c) on *Page fourteen*]



6. (continued)

(c) There are a wide variety of razors available on the market today.



With such a large selection, designers need to find ways of marketing their product in order to make it stand out from the competition.

Describe **two** marketing techniques that a design team may use to promote their product.

2

(d) Designers often have to generate new ideas to stay ahead of their competitors.

Describe **one** idea generation technique that they could use.

2

Total marks 8

[END OF QUESTION PAPER]





National
Qualifications
2014

2014 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 Detailed Marking Instructions for this assessment.
- (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) Mark consecutive responses to match the marks available in 'state' and 'give' questions e.g. 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.
- (d) Repetition of answers across different question parts is acceptable unless specifically stated otherwise in the question.

Marking Instructions for each question

Section 1

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(a)	(i)	One from: <ul style="list-style-type: none"> • cherry • mahogany • teak • walnut • oak • Any other suitable response 	1	<ul style="list-style-type: none"> • One mark for correct response • Balsa wood scores zero
		(ii)	A description that covers two of the following: <ul style="list-style-type: none"> • More variety of colours • Aesthetic ('looks good') • Durability • Better quality • Environmental • Strong • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each suitable consideration up to a maximum of two marks • <i>Easy to work with</i> scores zero
	(b)		Two from: <ul style="list-style-type: none"> • lap • corner rebate • mitre • dovetail • butt • dowel • biscuit joint • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each correct response up to a maximum of two marks • Finger joint scores zero marks
	(c)	(i)	A description that covers two of the following benefits: <ul style="list-style-type: none"> • Improves the appearance of the wood • Offers protection to the wood from bumps and scratches • Gives a waterproof surface • Gives a surface that can be easily wiped clean • Makes the wood more durable/hardwearing • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each correct description up to a maximum of two marks

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(c)	(ii)	<p>A description that includes two of the following points:</p> <ul style="list-style-type: none"> Remove pencil marks with eraser/sandpaper Sand wood smooth Dampen the wood to raise the grain Sand wood again with smooth sand/glass/garnet/ wet +dry paper Steel wool (wirewool) Remove dust / use white spirit / damp cloth Any other suitable response 	2	<ul style="list-style-type: none"> One mark for each correct description up to a maximum of two marks Sand with rough sandpaper Sand with smooth sandpaper 1 mark only
	(d)	(i)	<p>Explanations indicating that:</p> <ul style="list-style-type: none"> Rounded corners prevent tearing of the plastic when it is being formed around the pattern 	1	<ul style="list-style-type: none"> One mark for correct explanation
		(ii)	<p>Explanations indicating that:</p> <ul style="list-style-type: none"> Sloping sides allow the plastic to be removed easily from the pattern 	1	<ul style="list-style-type: none"> One mark for correct explanation
		(iii)	<p>One from:</p> <ul style="list-style-type: none"> A plastic that has plastic memory / can be reformed if mistakes are made Can be recycled Available in a range of colours Can easily be vacuum formed Easy to clean Cheap Easy to work with Any other suitable response 	2	<ul style="list-style-type: none"> One mark for each description up to a maximum of two marks A response such as <i>the thermoplastic is strong</i> scores zero marks.
	(e)	(i)	<p>A description that includes two of the following stages:</p> <ul style="list-style-type: none"> Fit the tool Fit the piece of work in the chuck Adjust compound slide to 45 degrees Move compound / cross slide to create chamfer Any other suitable response 	2	<ul style="list-style-type: none"> One mark for each correctly described stage up to a maximum of two marks Specific lathe parts not required to be named, however the answer must demonstrate an understanding of the process. Vague descriptions such as <i>pressing against the metal</i> score zero marks

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(e)	(ii)	<p>A description that includes two of the following:</p> <ul style="list-style-type: none"> • Fit the cutting tool • Fit the piece of work in the chuck • Move tool to the start of the cut with the cross slide • Reduce diameter with either compound slide or apron wheel • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each correctly described stage up to a maximum of two marks • Specific lathe parts not required to be named, however the answer must demonstrate an understanding of the process. • Vague descriptions such as <i>pressing against the metal</i> score zero marks
		(iii)	<p>One mark each for:</p> <ul style="list-style-type: none"> • Depending on the diameter of the material • Depending on the type of material • Depending on the process being carried out (knurling/finishing) 	2	<ul style="list-style-type: none"> • One mark for each correct response up to a maximum of two marks
	(f)	(i)	<p>One mark each for:</p> <ul style="list-style-type: none"> • It has a relatively low melting temperature • Lightweight • Does not corrode • Does not require finish • Aesthetic reasons ('looks good') • Strong • Durable • Non-ferrous • Easy to work with • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each correct response up to a maximum of two marks
		(ii)	<p>One mark each for:</p> <ul style="list-style-type: none"> • Can achieve intricate detail • Mass production • Speed of production • Inexpensive • Surface finish / looks good • Components are identical • Any other suitable response 	3	<ul style="list-style-type: none"> • One mark for each correct response up to a maximum of three marks • The response <i>easy scores</i> zero marks.
			Total marks	24	

Section 2

Question		Expected Answer(s)	Max Mark	Additional Guidance
2.	(a)	<p>Anthropometrics Areas that may be covered:</p> <ul style="list-style-type: none"> • Saddle length/width • Distance from saddle to peddles/saddle to handlebars • Distance between handles • Length/diameter of handles • Distance from handles to brakes • Length of brakes • Width/length of pedal • Length of gear trigger • Adjustable parts, eg saddle • Different frame sizes • Weight of cyclist • Any other suitable response <p>Physiology Areas that may be covered:</p> <ul style="list-style-type: none"> • Strength required to pedal/pull brakes/change handlebar or saddle height/turn handle bars & steer/change gear • Any other suitable response <p>Psychology Areas that may be covered:</p> <ul style="list-style-type: none"> • Overall look - reference to intended market/safety/ease of use • Sound from gear change/brakes/steering • Feel of grips on handle bars/brakes/saddle • Gear number indicators • Any other suitable response 	6	<ul style="list-style-type: none"> • To gain marks, candidates must describe the relationship between the ergonomic consideration and the part of the bicycle • Candidates may refer to: <ul style="list-style-type: none"> • Anthropometrics • Physiology • Psychology • There is no requirement to refer to any of these areas by name • Typical responses within each aspect are shown to the left • Six suitable responses will gain six marks • No marks for noting percentiles only, eg <i>95th percentile</i> on its own scores zero • Candidates can still gain marks if they mix up percentiles e.g. <i>50th percentile hand size to reach brakes</i> still scores one mark. • A list of bicycle parts scores zero marks.

Question			Expected Answer(s)	Max Mark	Additional Guidance
2.	(b)	(i)	<p><i>Example response:</i></p> <ul style="list-style-type: none"> • Durability would be researched because the user would expect the bike to last for several years without breaking or weakening. • The designer would need to research which materials and joining methods would be strong enough to resist knocks and bumps and be able to be used in all kinds of weather. • Any other suitable response 	1	<ul style="list-style-type: none"> • Suitable explanation of factor in relation to the product • Factor definitions score zero marks • Responses such as <i>the bike should last a long time</i> scores zero marks
	(b)	(ii)	<p><i>Example response:</i></p> <ul style="list-style-type: none"> • Ease of maintenance would be researched because a bike would have to be regularly maintained by the user in order to keep it in good working condition. • The designer may have to investigate methods of changing or pumping up tyres, oiling chains and cleaning so they could then make the bike as easy as possible to keep working safely. • Any other suitable response 	1	<ul style="list-style-type: none"> • References to low numbers of parts in the context of the question may attract marks.
		(iii)	<p><i>Example response:</i></p> <ul style="list-style-type: none"> • Aesthetics would have to be researched so that the design team would have a good understanding of what fashions and trends the intended market is interested in. • A bike for young girls would have a totally different look to a bike for teenage boys. • Any other suitable response 	1	<ul style="list-style-type: none"> • A response such as <i>people would buy the bike because it looks nice</i> would score one mark • Factor definitions score zero marks • Responses such as <i>needs to look good</i> scores 0 marks • Responses that lack reference to visual appeal score zero marks
			Total marks	9	

Question			Expected Answer(s)	Max Mark	Additional Guidance
3.			<p>Candidates may make reference to:</p> <ul style="list-style-type: none"> • Reduction in packaging • Miniaturisation • Recyclability • Upcycling • Number of parts/ease of separation of parts • Services offered by brand - removal & recycling of old • Energy use in production/in use • Energy use in transportation • Materials • Any other suitable response 	3	<ul style="list-style-type: none"> • Candidates must describe three areas in which a designer has made changes in order to make less of an environmental impact • The number of products discussed doesn't affect the marks given
4.	(a)	(i)	<p>Possible Graphic techniques:</p> <ul style="list-style-type: none"> • Rough sketches • Annotated sketches • Perspective sketches • 2D sketches • 3D sketches • Sketches • Roughts • Any other suitable response <p><i>Example response:</i> A designer may use annotated sketches at the initial ideas stage because it is a quick technique, allowing them to sketch out various ideas and note their thoughts next to them.</p>	2	<ul style="list-style-type: none"> • Candidates must link the graphic technique to the stage of the design process • Stating a graphic technique scores one mark (one mark for technique and one mark for description)

Question			Expected Answer(s)	Max Mark	Additional Guidance
4.	(a)	(ii)	<p>Possible Graphic techniques:</p> <ul style="list-style-type: none"> • Working drawing • Exploded views • Assemblies • Sections • 3D solid CAD model • Storyboard • Any other suitable response <p><i>Example responses:</i> A working drawing would be used at the planning for manufacture stage as the design team would need to note down the accurate dimensions of the product.</p> <p>The assembly drawing will help the team understand what it looks like and how the components fit together.</p>	2	<ul style="list-style-type: none"> • References to physical models score zero marks. • Stating a graphic technique scores one mark (one mark for technique and one mark for description)
	(b)		<p>Modelling Materials:</p> <ul style="list-style-type: none"> • Paper • Card • Corrugated Card • MDF • Wire • Pipe Cleaners • Foam • Clay • Modelling compound • Balsa Wood • Expanded Foam • Sheet Plastic • Construction kit • Wood • Any other suitable response <p><i>Example responses:</i> Corrugated card is a good material for modelling as it can be easily joined with masking tape. (2 marks)</p> <p>Designers use clay because it can be easily shaped with your hands and can be made into unusual shapes that can't be made with sheet material. (2 marks)</p>	4	<ul style="list-style-type: none"> • Candidates must select two appropriate modelling materials <u>and</u> explain why each is suitable for building models to gain full marks • One mark for each material and one mark for each suitable explanation • Materials must be considered in context e.g. blue foam / Styrofoam are not cheap compared to other modelling materials.
			Total marks	8	

Question			Expected Answer(s)	Max Mark	Additional Guidance
5.	(a)	(i)	<ul style="list-style-type: none"> • Water/rust resistant • Tasteless • Aesthetics - modern look/ matches other appliances • Easy to clean • Hygienic • Resists chemical cleaners • Ergonomic reasons • Link to manufacturing process - available in sheet form • Strong / hardwearing / robust • Heavy (for stability during use) • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each suitable reason up to a maximum of two marks
		(ii)	<ul style="list-style-type: none"> • Speed of production • Economies of scale / cheaper • Component accuracy • Quality of finish • Uniformity • Reduced workforce • Any other suitable response 	2	<ul style="list-style-type: none"> • One mark for each suitable description up to a maximum of two marks • The response <i>easy</i> scores zero marks.
	(b)		<ul style="list-style-type: none"> • Injection moulding 	1	<ul style="list-style-type: none"> • Accept compression moulding
	(c)		<ul style="list-style-type: none"> • Cost of equipment/machinery • Cost to maintain equipment/ machinery • Cost of staff training • Time for staff training/re-training • Impact on environment of new equipment/machinery • Disposal of old equipment/ machinery • Can stay ahead of the competition/adapt designs/ new designs • Allow new shapes/less joining techniques to be used • Reduce unit cost • Reduce labour costs • Reduce material used • Quicker production methods • More accurate production methods • Can facilitate rapid prototyping • Any other suitable response 	3	<ul style="list-style-type: none"> • One mark for each suitable statement up to a maximum of three marks
			Total marks	8	

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	(a)	<p><i>Example responses:</i> Users could press the button to switch the razor on and off. They could then comment on ease of use. (2 marks)</p> <p>The users could hold the razor and comment on how comfortable it is to hold. (2 marks)</p>	2	<ul style="list-style-type: none"> • Candidates may describe the evaluation method and link it to the razor to gain full marks • Generic responses such as <i>handing out the razors and asking for feedback on their use</i> can score full marks • Responses in the form of basic questions score zero marks e.g. <i>Can the users hold it comfortably?</i> • Any combination of two of the statements below would score two marks. <ul style="list-style-type: none"> 1. Hand out the product to a range of users 2. Test on/off button by pressing with thumb 3. Report back on results of above
	(b)	<p><i>Example responses:</i></p> <p>Comment on the shape of the razor.</p> <p>Rate the colour of the razor on a scale of 1 to 10, 10 being the best.</p>	2	<ul style="list-style-type: none"> • Candidates must reference aesthetic terms e.g. <i>does the razor appeal to you?</i> scores zero marks whereas <i>does the razor look appealing</i> scores one mark.

Question		Expected Answer(s)	Max Mark	Additional Guidance
6.	(c)	<p>Possible answers:</p> <ul style="list-style-type: none"> • Eye-catching packaging • Reduced or lower price point/ introductory offer • Promotional offers - BOGOF/ free shaving gel • Sell under a brand name • Adapt to suit a new market segment • Celebrity endorsement • Specific advertising techniques • Any other suitable response <p><i>Example responses:</i> A design team may decide to reduce the price of the razor when it enters onto the market. (1 mark)</p> <p>A design team may get people interested in buying their products by offering an additional product, for example free shaving gel or moisturiser. (1 mark)</p>	2	<ul style="list-style-type: none"> • One mark for each correct response up to a total of two marks • Advertising techniques can only score one mark (i.e. two advertising techniques would only score one mark)
6.	(d)	<p>Candidates must describe one of the following to gain full marks:</p> <ul style="list-style-type: none"> • Morphological Analysis • Brain storming • Technology Transfer • Analogy • Lateral Thinking • Mood board • Lifestyle board • Take your pencil for a walk • Design Stories • Gathering public opinion through a market survey <p><i>Example answer:</i> Brain storming The team will sit together and note down all of the ideas each person has, no matter how silly they seem. Some ideas may spark off thoughts in others, allowing different suggestions to be explored in the hope of coming up with a new idea.</p>	2	<ul style="list-style-type: none"> • Up to two marks for correctly describing an idea generation technique • No marks for simply naming a technique • Candidates may score two marks if they correctly describe an idea generation technique even although they have incorrectly named it
Total marks			8	

[END OF MARKING INSTRUCTIONS]