



# **MATERIALS DESIGN AND TECHNOLOGY**

## **ATAR course examination 2021**

### **Marking key**

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

**Section One: Short answer**

**15% (32 Marks)**

**Question 1**

**(9 marks)**

- (a) List **three** elements and **three** principles of design shown in the Forest chair. (6 marks)

Description	Marks
The three elements of design	
One mark each for correctly listed element of design	1–3
<b>Subtotal</b>	<b>3</b>
The three principles of design	
One mark each for correctly listed principle of design	1–3
<b>Subtotal</b>	<b>3</b>
<b>Total</b>	<b>6</b>
Answers could include: Elements of design: <ul style="list-style-type: none"> <li>• colour, tone, line, form, shape, texture.</li> </ul> Principles of design: <ul style="list-style-type: none"> <li>• balance, dominance, proportion, contrast, emphasis, rhythm, repetition, gradation, radiation, harmony, unity.</li> </ul>	

- (b) Describe how the designer used the elements **or** principles of design to enhance the marketability of the Forest chair. (3 marks)

Description	Marks
Describes how the designer used the elements or principles of design to enhance the marketability of the Forest chair	3
Outlines how the designer uses of the elements or principles of design to enhance the marketability of the Forest chair	2
Makes general statement about the marketability of the Forest chair	1
<b>Total</b>	<b>3</b>
Answers could include: The designer has included elements or principles of design to appeal to an identified target market who like nature and gardens. By using organic line, shape, colours and form they have replicated natural beauty. For example: <ul style="list-style-type: none"> <li>• line – the organic branch pattern reinforces the function of the chair to be used in a garden and therefore appeals to a target market that values nature and the environment.</li> <li>• colour – the chair comes in multiple colours, either muted or vibrant – to appeal to different market segments and aesthetic tastes.</li> <li>• repetition – the tree branch silhouette pattern is repeated for each chair to give a clear sense of cohesiveness, and therefore promote the purchase of multiple chairs.</li> <li>• balance – the subtle curves and uncomplicated legs of the chair balance the organic pattern of the design and reflect the natural design elements.</li> </ul> Accept other relevant answers.	

## Question 2

(13 marks)

- (a) Describe the role of client research **or** market research in developing the design for your major Year 12 production task. (3 marks)

Description	Marks
Describes the role of client research or market research in developing the design for the major Year 12 production task	3
Outlines the role of client research or market research in developing the design for the major Year 12 production task	2
Makes a general statement about the major Year 12 production task or about client research or market research	1
<b>Total</b>	<b>3</b>
<p>Answers could include:</p> <ul style="list-style-type: none"> <li>• focusses the design on the client's needs, values and beliefs</li> <li>• avoids costly mistakes, wasting materials, time, energy and other resources</li> <li>• client gets what they want.</li> </ul> <p>Sample answer: My client asked me to make a games table to be used by her family at home. In order to design a piece that would function well and look good I interviewed my client to find out about her needs, values and beliefs, and I went to her home to view the environment where the table would sit. This research helped me meet the client's needs, and eliminate costly mistakes.</p> <p>Accept other relevant answers.</p>	

- (b) Identify **three** techniques that could be used to carry out market research. (3 marks)

Description	Marks
One mark for each correctly identified market research technique	1–3
<b>Total</b>	<b>3</b>
<p>Answers could include:</p> <ul style="list-style-type: none"> <li>• client interviews</li> <li>• market/target audience surveys</li> <li>• focus groups</li> <li>• social media</li> <li>• sample/test products</li> <li>• internet search about market demographics</li> <li>• consumer competitions.</li> </ul> <p>Accept other relevant answers.</p>	

**Question 2** (continued)

- (c) Outline **three** benefits of using information and communication technology (ICT) when conducting market research. (3 marks)

Description	Marks
One mark for each outlined benefits of using ICT when conducting market research	1–3
<b>Total</b>	<b>3</b>
Answers could include: <ul style="list-style-type: none"> <li>• easier and quicker to create tools such as surveys and questionnaires</li> <li>• faster to reach target audiences with surveys and social media</li> <li>• quicker for participants to respond and return response</li> <li>• cheaper by involving fewer employees – lower labour costs, less paper with electronic surveys and responses, less cost for phone polling</li> <li>• ability to reach a bigger population sample (remote and niche groups)</li> <li>• easier and quicker to collate data and analyse results</li> <li>• easier to research a wider range of existing products.</li> </ul> Accept other relevant answers.	

- (d) Describe **two** advantages for a designer of being able to predict the trends in a target market. (4 marks)

Description	Marks
For each of the two advantages (2 × 2 marks)	
Describes an advantage for a designer of predicting trends in a target market	2
Makes a general statement about the advantage of predicting trends in a target market	1
<b>Total</b>	<b>4</b>
Answers could include: <p>Advantages:</p> <ul style="list-style-type: none"> <li>• predicting trends can help a designer remain competitive when choosing the features of products, types of materials and price range of their products</li> <li>• by predicting trends designers can increase the appeal of their product, improving their chance of success, their profitability and continuing place in the market</li> <li>• designers can use this information to target niche markets with appealing products and to innovate within their established market for future success</li> <li>• they can differentiate themselves from competitors</li> <li>• designers can look for emerging wants, changing values, new concepts and fashions to direct product design.</li> </ul> Accept other relevant answers.	

## Question 3

(10 marks)

- (a) Identify **three** pieces of anthropometric data that would have been considered in the design of the pizza cutter. (3 marks)

Description	Marks
One mark for each correctly identified item of anthropometric data	1–3
<b>Total</b>	<b>3</b>
Answers could include: Anthropometric data includes: <ul style="list-style-type: none"> <li>• finger/thumb dimensions</li> <li>• palm width/breadth</li> <li>• palm length</li> <li>• hand size</li> <li>• arm length</li> <li>• wrist diameter</li> <li>• forearm length</li> <li>• grip diameter.</li> </ul>	
Accept other relevant answers.	

- (b) Explain the relationship that exists between anthropometric data, safety and ergonomics when they are applied to the design of a product. (4 marks)

Description	Marks
Explains the relationship that exists between all three fundamentals: anthropometric data, safety and ergonomics, when they are applied to the design of a product	4
Describes the relationship that exists between all three fundamentals: anthropometric data, safety and ergonomics, when they are applied to the design of a product	3
Outlines the relationship that exists between some fundamentals: anthropometric data, safety and ergonomics when they are applied to the design of a product	2
Makes a general statement about the relationship between design fundamentals	1
<b>Total</b>	<b>4</b>
Answers could include: Anthropometric data are data of human body size and shape. To create accurate and functional ergonomics it is essential to use measurements based on anthropometric data. When the ergonomics of products are accurate, then safety will be enhanced because products will be the right shape and size, fit correctly and be more comfortable for the end user. This means they are more likely to be used correctly, causing less strain on the body and reducing the chance of injury.	
Accept other relevant answers.	

**Question 3** (continued)

(c) Outlines **three** reasons for making a prototype during a design process. (3 marks)

Description	Marks
For each reason (3 × 1 mark)	
Outlines a reason for making a prototype during a design process	1
<b>Total</b>	<b>3</b>
<p>Answers could include:                      Reasons include to:</p> <ul style="list-style-type: none"> <li>• test the processes of manufacturing/construction in order to be more accurate and more efficient with time, money, resources and materials</li> <li>• determine how the materials and/or manufacturing process affect the function and aesthetics of the product and meet the design needs</li> <li>• get feedback on the design and make improvements based on the feedback which will aid success with the target market when the product goes on sale</li> <li>• test how the anthropometrics/size/shape meet the design needs and the target market needs to ensure correct function and safety</li> <li>• test the ergonomics: to ensure the handle fits the intended user, and is comfortable to use</li> <li>• check costings and consolidate the estimated budget and intended market price</li> <li>• test the product safety and ensure it meets OHS standards, minimising risks to users and manufacturers.</li> </ul>	
Accept other relevant answers.	

## Section Two: Extended answer

25% (36 Marks)

## Question 4

(14 marks)

- (a) List **four** proactive measures to ensure students' safety in a workshop. (4 marks)

Description	Marks
One mark for each correctly identified proactive measure	1–4
<b>Total</b>	<b>4</b>
Answers could include: <ul style="list-style-type: none"> <li>• training and induction programs</li> <li>• correct signage</li> <li>• supply PPE</li> <li>• adequate ventilation in the workshop</li> <li>• correct labelling and storage of chemicals and harmful substances</li> <li>• establish a culture of reporting hazards</li> <li>• install a register/log book for recording incidents</li> <li>• MSDs for chemicals and harmful materials</li> <li>• control hazards.</li> </ul>	
Accept other relevant answers.	

- (b) Describe **three** ways of controlling hazards that have been identified in a workshop. (6 marks)

Description	Marks
For each of the three ways (3 × 2 marks)	
Describes a way to control hazards that have been identified in a workshop	2
Makes general statement about control hazards that have been identified in a workshop	1
<b>Total</b>	<b>6</b>
Answers could include: Control hazards: <ul style="list-style-type: none"> <li>• eliminate the hazard from the workplace: try to ensure that hazards are designed out when new materials, equipment and work systems are being planned for the workplace</li> <li>• remove, reorganise or substitute the hazard: where possible remove the hazard or substitute with less hazardous materials, equipment or substances</li> <li>• enclose or isolate the hazard: this can be done through the use of barriers, introducing a strict work area, enclosing a noisy process from a person</li> <li>• minimise through engineering controls: this can be done through the use of machine guards, effective ventilation systems etc.</li> <li>• minimise the risk by adopting administrative controls: establish appropriate procedures and safe work practices such as rotation to reduce exposure time or boredom; routine maintenance and housekeeping procedures; training on hazards and correct work methods</li> <li>• personal protective equipment: provide suitable and properly maintained personal protective equipment and ensure students and employees are trained in its proper use (examples include gloves, earplugs etc.).</li> </ul>	
Accept other relevant answers.	

**Question 4** (continued)

- (c) Identify **two** areas of information given on a Material Safety Data (MSD) sheet and state the purpose of material safety data. (4 marks)

Description	Marks
One mark each for correctly identifying areas of information given on a MSD sheet	1–2
<b>Subtotal</b>	<b>2</b>
<b>Purpose</b>	
States the purpose of material safety data	2
Makes a general statement about material safety data	1
<b>Subtotal</b>	<b>2</b>
<b>Total</b>	<b>4</b>
<p>Answers could include:</p> <p>Areas of information on MSDs:</p> <ul style="list-style-type: none"> <li>• product identification and use</li> <li>• hazardous ingredients</li> <li>• physical data</li> <li>• fire and explosion data</li> <li>• reactivity data</li> <li>• toxicological properties</li> <li>• preventive measures</li> <li>• first aid measures.</li> </ul> <p>Purpose of MSD:</p> <p>The purpose of material safety data is to inform users of the potential hazards and how to work safely with a chemical product or material, and to minimise risk in the workshop.</p>	
Accept other relevant answers.	



## Question 5

(7 marks)

- (a) Choose **one** of the images above and identify a computer numerically-controlled (CNC) process that could have been used to manufacture the product. (1 mark)

Description	Marks
One mark for correctly identifying an appropriate CNC process	1
<b>Total</b>	<b>1</b>
<p>Answers could include:</p> <p>Knit shirt: laser cutting decorative back panel, seamless technology to make garment, CNC sewing machine to join seams, CNC knitting machine to make fabric, cricut for cutting decorative panels.</p> <p>Metal clock: CNC laser cutting, CNC plasma cutting, CNC water jet cutting.</p> <p>Wooden decorative box: For the decorative lid and sides of the box CNC laser engraving or CNC router. Components/parts of the decorative box could have been cut out with CNC overhead router.</p> <p>Accept other relevant answers.</p>	

- (b) Outline **two** reasons a designer would choose to use the process identified in part (a) to create a product. (2 marks)

Description	Marks
One mark for each outlined reason a designer would choose this process.	1–2
<b>Total</b>	<b>2</b>
<p>Answers could include:</p> <ul style="list-style-type: none"> <li>• faster – more efficient, cheaper</li> <li>• can create more current and more intricate designs</li> <li>• can only be done using CNC process</li> <li>• repeatability – can modify designs easily, based on client feedback</li> <li>• reduce waste.</li> </ul> <p>Accept other relevant answers.</p>	

- (c) Discuss **one** positive environmental impact of using the process identified in part (a). (4 marks)

Description	Marks
Discusses a positive environmental impact of using the process	4
Describes a positive environmental impact of using the process	3
Outlines a positive environmental impact of using the process	2
Makes general statement about a positive environmental impact	1
<b>Total</b>	<b>4</b>
<p>Answers could include:</p> <ul style="list-style-type: none"> <li>• processes may minimise waste, and create less landfill</li> <li>• greater efficiency and faster processing may use less energy and produce less land, air and water pollution</li> <li>• processes may use less materials requiring less resources, less transport and creating less waste</li> <li>• manufacturing can be done locally rather than offshore, which reduces transportation and can ensure safe environmental practices are being adhered to.</li> </ul> <p>Accept other relevant answers.</p>	

## Question 6

(8 marks)

Outline the historical, social, cultural and political aspects of using Aboriginal and Torres Strait Islander art as a source of design inspiration.

Description	Marks
For each of the four aspects (4 × 2 marks)	
Outlines aspect of using aboriginal art as a source of design inspiration: historical, social, cultural and political	2
Makes general statement of the aspect	1
<b>Total</b>	<b>8</b>
Answers could include: <ul style="list-style-type: none"><li>• Historical: Aboriginal art and traditions are among the oldest in human history. They are a record of the land and the people's relationship with it.</li><li>• Social: Australian aboriginal art is recognised as an internationally unique art form that is sacred to aboriginal culture and strengthens the economic and social welfare of its people. Exhibited in public spaces, it enhances respect for aboriginal culture.</li><li>• Cultural: the use of aboriginal art in public spaces is normalising the importance of aboriginal culture in mainstream society through the celebration of artwork on commercial property. It helps others understand aboriginal culture, improving entrenched racism and combating the effects of colonisation. It may be seen as Australia's greatest cultural export.</li><li>• Political: Aboriginal art on commercial brands reinforces and enhances the importance of historical and contemporary connections with aboriginal people. It provides a platform for aboriginal people to effect change to detrimental political and legislative controls, improving equal rights.</li></ul>	
Accept other relevant answers.	

## Question 7

(7 marks)

- (a) Examine the graph above and explain, with reference to the features, which design would be the **most** sustainable. (4 marks)

Description	Marks
Explains, with reference to all features, that Design C would be the most sustainable	4
Describes, with reference to all features, that Design C would be the most sustainable	3
Outlines, with some reference to the features, that Design C would be the most sustainable	2
Makes a general statement about sustainability of a design	1
<b>Total</b>	<b>4</b>
<p>Sample answer: Based on the information in the graph Design C is the most sustainable design. It scores higher on four of the five criteria for sustainability. It has the poorest score for water use, but this is compensated for by being stronger in energy use, transport, durability and recyclability than Designs A and B. Having the highest score for durability is important as it will outlast the other two and need replacing less frequently. This means fewer resources will be needed to replace it over time. Being more recyclable than the other two also means more resources can be recovered and reused for other products.</p>	
Accept other relevant answers.	

- (b) Outline **three** recommendations on how energy use could be reduced to improve the sustainability of the designs. (3 marks)

Description	Marks
One mark for each correctly recommended way energy use could be reduced to improve the sustainability of the designs	1–3
<b>Total</b>	<b>3</b>
<p>Answers could include:</p> <ul style="list-style-type: none"> <li>• reduce energy use through improved processes</li> <li>• use renewable energy sources such as solar, wind, wave</li> <li>• use materials that require less processing</li> <li>• use improved technology, e.g. LED lighting</li> <li>• clean and maintain machinery and ventilation</li> <li>• shut down machinery and lighting when not in use</li> <li>• manage power settings.</li> </ul>	
Accept other relevant answers.	

**Section Three: Wood context**

**60% (77 Marks)**

**Question 8**

**(11 marks)**

- (a) In the table below, name each of the timber conversion processes and list **one** advantage and **one** disadvantage for each process. (9 marks)

Description		Marks
One mark for each correct answer		1–9
<b>Total</b>		<b>9</b>
Answers could include:		
	<b>Advantage</b>	<b>Disadvantage</b>
Process name: Live sawn or through and through	<ul style="list-style-type: none"> <li>• simple</li> <li>• cost-effective</li> <li>• little waste</li> <li>• good for mass production of boards</li> </ul>	<ul style="list-style-type: none"> <li>• timber may warp or shrink unevenly</li> </ul>
Process name: Back sawn or plain sawn	<ul style="list-style-type: none"> <li>• seasons quickly</li> <li>• good figure on face</li> <li>• less prone to splitting</li> <li>• wider sections possible – fewer knots</li> </ul>	<ul style="list-style-type: none"> <li>• shrinks across the width when drying</li> <li>• more likely to warp or cup</li> </ul>
Process name: Quarter sawn or radial cut	<ul style="list-style-type: none"> <li>• best grain on face</li> <li>• good wearing surface for floors</li> <li>• radial face preferred for coat rings</li> <li>• less cupping and warping</li> </ul>	<ul style="list-style-type: none"> <li>• slower seasoning</li> <li>• expensive conversion</li> </ul>
Accept other relevant answers.		

- (b) Outline the connection between a timber’s structure, properties and end use in its selection for a manufactured product. (2 marks)

Description	Marks
Outlines the connection between a timber’s structure, properties and end use in its selection for a manufactured product	2
Makes a general statement about a timber’s structure, properties, and end use in its selection for a manufactured product	1
<b>Total</b>	<b>2</b>
Answers could include: General considerations of grain character, grain structure (soft vs hardwood) dimensional stability, cost of production and retail cost would dictate the end use it was chosen for. For example, quarter sawn timber is used for flooring because it has a higher resistance to wear, even though it is more expensive to buy than live sawn timber.	
Accept other relevant answers.	

Question 9

(22 marks)

- (a) In the space below, create **three** annotated rapid concept sketches. Each sketch must address **one** of the design issues described on page 6. (12 marks)

Description	Marks
For each of the three rapid concept sketches (3 × 2 marks)	
Detailed rapid concept sketch addressing the specified design issues	2
Legible sketch addressing some of the specified design issues	1
<b>Subtotal</b>	<b>6</b>
For the annotations on each of the three rapid concept sketches (3 × 2 marks)	
Detailed annotations	2
Limited annotations	1
<b>Subtotal</b>	<b>6</b>
<b>Total</b>	<b>12</b>
Possible solutions include:	
<ul style="list-style-type: none"> <li>• stability could be addressed with a wider base that has more material at the back of the stand to prevent tipping</li> <li>• the menu button could be addressed by routing a groove 90° to the slot so that it is directly in line with the button or the phone supported by a small lip in the front and higher back much like a painter’s easel</li> <li>• incorporation of images from popular, historic or political culture.</li> </ul>	
Accept other relevant answers.	

- (b) Justify **one** of your design concepts from part (a) using **six** design fundamentals. (6 marks)

Description	Marks
Justifies one design concept using six design fundamentals	6
Discusses one design concept using six design fundamentals	5
Explains one design concept using some design fundamentals	4
Describes design concept using some design fundamentals	3
Outlines design fundamentals in one design concept	2
Makes a general statement about the design fundamentals	1
<b>Total</b>	<b>6</b>
Answers could include:	
<ul style="list-style-type: none"> <li>• aesthetics – changing the colour of the finish</li> <li>• function – additional features that were not outlined in the question</li> <li>• safety – speaker doesn’t amplify the sound too much</li> <li>• cost – made to look expensive to appeal to a premium market</li> <li>• environmental impact – materials can be recycled at end of use</li> <li>• sustainability issues – materials sourced from plantation timber</li> <li>• ergonomics – easy enough to be held with one hand while the phone is connected to the power source</li> <li>• anthropometric data – considered to accommodate smaller phones because most users’ hands would suit smaller phones.</li> </ul>	
Accept other relevant answers.	

**Question 9** (continued)

(c) Identify **four** advantages of making the charger/speaker from natural timber. (4 marks)

Description	Marks
One mark for each correctly identified advantage of making the charger/speaker from natural timber	1–4
<b>Total</b>	<b>4</b>
Answers could include: Advantages: <ul style="list-style-type: none"> <li>• natural timber is readily available in a range of sizes and types</li> <li>• some timbers are easy to work with</li> <li>• it's biodegradable</li> <li>• may be a sustainable resource</li> <li>• it will accept a range of finishes</li> <li>• it can be cheap depending on the type</li> <li>• aesthetically pleasing.</li> </ul>	
Accept other relevant answers.	

Question 10

(12 marks)

- (a) Define what is meant by the term 'hardwood'. (1 mark)

Description	Marks
Defines the term hardwood	1
<b>Total</b>	<b>1</b>
Answers could include: <ul style="list-style-type: none"> <li>hardwoods are produced by angiosperm trees that reproduce by flowers, and have broad leaves</li> <li>hardwoods have a more complex structure than softwoods and are often much slower growing as a result</li> <li>a group of trees with similar characteristics or properties.</li> </ul> Accept other relevant answers.	

- (b) Define what is a man-made material, and state **two** advantages of its use for the Red and Blue Chair. (3 marks)

Description	Marks
One mark for correctly defining a man-made material	1
For each of the two advantages	
States correct advantage	1
<b>Subtotal</b>	<b>2</b>
<b>Total</b>	<b>3</b>
Answers could include: Definition: produced, formed, or made by humans. Produced artificially; not resulting from natural processes. Advantages of using plywood: <ul style="list-style-type: none"> <li>dimensionally stable over larger areas</li> <li>easier to manufacture uniform thickness in the material</li> <li>structurally strong, doesn't warp</li> <li>accepts a range of finishes such as paint, lacquer, oil.</li> </ul> Accept other relevant answers.	

- (c) (i) Describe the process used to prepare the chair for applying the paint and lacquer. (2 marks)

Description	Marks
Describes the process used to prepare the chair for applying the paint and lacquer	2
Makes a general statement about the process used to prepare the chair	1
<b>Total</b>	<b>2</b>
Answers could include: The chair would be sanded with several different grades of abrasive paper, before a sealing coat was applied to the timber. Accept other relevant answers.	

**Question 10** (continued)

- (ii) Describe how the paint and lacquer were used to enhance the timber. (2 marks)

Description	Marks
Describes how the paint and lacquer were used to enhance the timber	2
Makes a general statement about the paint and/or lacquer	1
<b>Total</b>	<b>2</b>
Answers could include: Coloured paint was used for aesthetics and durability. The lacquer was used to increase the gloss level of the finish and protect the paint from wear. Accept other relevant answers.	

- (d) Considering the end use of the chair, describe how the finishes might protect the chair. (2 marks)

Description	Marks
Describes how the finishes might protect the chair	2
Makes a general statement about the finishes	1
<b>Total</b>	<b>2</b>
Answers could include: The finishes will protect the seat and back which would be prone to rubbing from people sitting on it, and protect the stability of the frame from environmental changes in moisture and air temperature. Accept other relevant answers.	

- (e) Identify and justify an appropriate adhesive that might be used in the construction process, using appropriate workshop terminology. (2 marks)

Description	Marks
Identifies an appropriate adhesive and justifies its use, applying appropriate terminology	2
Makes a general statement about an adhesive with limited or no justification	1
<b>Total</b>	<b>2</b>
Answers could include: The chair could have been constructed using polyurethane glue because it forms a very strong water-resistant bond that is particularly good for gluing timber that is under high stress. Accept other relevant answers.	



## Question 11

(10 marks)

Using the drawings, parts and price lists, complete the costing table for making **one** shelving unit. Round costs to the nearest cent. All sizes to be in millimetres (mm).

Description							Marks
One mark for each correct calculation							1–10
<b>Total</b>							<b>10</b>
Answers could include:							
Part name	Material description	Number required	Length	Width	Cost (\$/m <sup>2</sup> or \$/Lm)	Total m <sup>2</sup> rounded to two decimal places	Cost
Carcass top and bottom	18 mm MDF pine veneer	2	650 mm	200 mm	\$36.20	<b>0.26</b>	<b>\$9.41</b>
Plain moulding	42 x 19 dressed pine	1	1200 mm	n/a	\$ 2.50	n/a	<b>\$3.00</b>
Ogee moulding	19 x 19 dressed pine	1	1200 mm	n/a	\$ 1.80	n/a	<b>\$2.16</b>
Sides of carcass	18 mm MDF pine veneer	<b>2</b>	400 mm	200 mm	\$36.20	0.16	<b>\$5.79</b>
Shelves	12 mm plain MDF	2	624 mm	200 mm	\$10.85	<b>0.25</b>	\$2.71
Colonial skirting	60 x 19 dressed pine	1	1200 mm	n/a	\$ 6.20	n/a	<b>\$7.44</b>
Backing board	3 mm plain MDF	1	630 mm	420 mm	\$ 3.60	0.26	<b>\$0.94</b>
<b>Total cost</b>							<b>\$31.45</b>

**Question 12**

**(14 marks)**

(a) Define the term 'globalisation'.

(2 marks)

Description	Marks
Defines the term globalisation	2
Makes a general statement about globalisation	1
<b>Total</b>	<b>2</b>
Answers could include: Globalisation is the process whereby local, national and international economies and cultures are linked through a network of trade, communication and transport. Accept other relevant answers.	

(b) Review the specifications of the chair above and outline **three** impacts of globalisation affecting its production.

(6 marks)

Description	Marks
For each of the three impacts (3 × 2 marks)	
Outlines the impact of globalisation affecting the production of the chair	2
Makes a general statement about the impact of the globalisation	1
<b>Total</b>	<b>6</b>
Answers could include: Globalisation has a broad impact on people, cultures and the environment. <ul style="list-style-type: none"> <li>• the lounge chair has components made in the USA and in China where labour is cheaper, thus creating cheaper products and bigger profit margins</li> <li>• it can be produced in ethical factories, but countries are often less strict about human rights and child labour and safety standards can be ignored. Thus, big corporations can act with less accountability.</li> <li>• overseas production can cause the decline of local manufacturing due to high price of Australian dollar and reducing jobs available locally</li> <li>• globalisation allows easier access to primary resources for materials and for designers to access materials unavailable in their homeland</li> <li>• globalisation can create bonding of people across countries where collaboration occurs. This can lead to the development of further projects with benefits for both communities.</li> <li>• globalisation can transmit cultures and traditions readily. Conversely, with Australian styles and designs being introduced to manufacturing countries consumers in those countries can lose their own heritage and local styles/goods, becoming more westernised as global companies move in.</li> <li>• the movement of designs globally causes piracy of designs, stealing of intellectual property and improper appropriation of cultures, icons and identities</li> <li>• the increased transport between the USA, China and WA causes increased air and ocean pollution</li> <li>• globalisation makes social networking to advertise and market goods easier and more effective</li> <li>• scamming and spamming people with fakes</li> <li>• more investment in developing countries.</li> </ul> Accept other relevant answers.	

- (c) Discuss how green design principles can be incorporated into the design and production of the chair. (6 marks)

Description	Marks
Discusses how green design principles can be incorporated into the design and production of the chair	6
Explains how green design principles can be incorporated into the design and production of the chair	5
Describes how two or more green design principles can be incorporated into the design and production of the chair	4
Outlines how two or more green design principles can be incorporated into the design and production of the chair	3
Outlines green design principles	2
Makes general statements about green design principles	1
<b>Total</b>	<b>6</b>
<p>Answers could include:</p> <p>Efficient use of energy and materials:</p> <ul style="list-style-type: none"> <li>• using green materials as an alternative</li> <li>• using materials from sustainable sources</li> <li>• using less materials in each product</li> <li>• reduce number of processes used to make a product</li> <li>• minimise waste during production</li> <li>• reduce packaging</li> <li>• use renewable energy.</li> </ul> <p>Pollution and waste reduction:</p> <ul style="list-style-type: none"> <li>• minimise transport – manufacture close to the market</li> <li>• source materials locally to decrease transportation emissions</li> <li>• easily transported – lightweight/stackable/flatpack</li> <li>• improve energy efficiency of products</li> <li>• use more durable materials to increase lifespan of a product.</li> </ul> <p>Minimising waste at the end of the life of the product:</p> <ul style="list-style-type: none"> <li>• using recyclable materials</li> <li>• labelling of plastic components to assist recycling</li> <li>• use compostable packaging</li> <li>• consider how product will be disposed of/re-used/recycled.</li> </ul> <p>Accept other relevant answers.</p>	

**Question 13**

**(8 marks)**

Discuss how human factors have affected the development of manufacturing processes.

Description	Marks
Discusses how human factors have affected the development of manufacturing processes	7–8
Explains how human factors have affected the development of manufacturing processes	5–6
Describes some ways human factors have affected the development of manufacturing processes	3–4
Outlines ways human factors have affected the development of manufacturing processes	2
Makes a general statement about human factor/s in the workplace	1
<b>Total</b>	<b>8</b>
<p>Answers could include:</p> <p>Manufacturing processes have been designed by humans to include the interaction of humans with machinery and processes. Human factors affect manufacturing processes in positive and negative ways. Humans have continually created new materials, products and process, and they have refined manufacturing processes to be faster, safer, more efficient and more profitable. As manufacturing processes require human skills, they must be designed to suit the needs of the workforce.</p> <p>Human factors influence where work is done, the way that work is carried out and the productivity of companies. Human requirements affect the design of buildings, machinery and manufacturing processes, and the type of materials used for products. Human factors have a limiting effect on manufacturing processes; humans get injured, make mistakes, forget, need holidays, get sick and take leave for a range of reasons. Manufacturers have developed processes to minimise the impact of these factors. The use of automation and robot technologies have replaced work done by humans that was unsafe, pressured, slow, tedious, repetitive and unhealthy.</p> <p>Governments legislate to protect and support human resources, so manufacturing processes have developed to meet these requirements. Workplaces must now have a safe and healthy physical environment with correct lighting, ventilation, noise levels, hygiene, ergonomic setup (work benches, equipment, seating, etc.), room temperature, lifting and safety equipment, so manufacturing processes have been developed to meet these needs.</p> <p>As society changes manufacturing processes develop to keep pace. Change in demand for goods and changes in social values, such as the focus on human rights and ethical treatment of workers, cause manufacturing processes to change. Changes in manufacturing processes leads to increased need for training and upskilling of the workforce.</p> <p>Accept other relevant answers.</p>	

Section Three: Metal context

60% (77 Marks)

Question 14

(11 marks)

- (a) In the table below, name each of the metal fasteners and lists **one** advantage and **one** disadvantage for each fastener. (9 marks)

Description		Marks
One mark for each correct answer		1–9
<b>Total</b>		<b>9</b>
Answers could include:		
	<b>Advantage</b>	<b>Disadvantage</b>
Fastener name: pop rivet, blind rivet	<ul style="list-style-type: none"> <li>fast process</li> <li>lightweight</li> <li>can join dissimilar metals inexpensive</li> <li>work piece not subject to high temperatures that might affect mechanical properties</li> <li>aesthetically pleasing</li> </ul>	<ul style="list-style-type: none"> <li>lack of strength</li> <li>cannot rivet a blind hole</li> <li>must be cut or drilled to remove</li> <li>drilled hole can be a source of weakness in a structure</li> </ul>
Fastener name: nut and bolt	<ul style="list-style-type: none"> <li>good strength</li> <li>easily disassembled</li> <li>designed to take tensioned loads</li> </ul>	<ul style="list-style-type: none"> <li>can become loose over time</li> <li>requires access to both sides of the joint</li> <li>corrosion between bolt and parent metal</li> </ul>
Fastener name: machine screw, socket screw, button screw, machine bolt	<ul style="list-style-type: none"> <li>comes in smaller sizes</li> <li>very precise</li> <li>available in different types of materials</li> <li>can come in a number of head types, including hex, torx and posidrive</li> <li>less likely to come loose due to extra threads</li> <li>more threads allow for greater control for getting correct amount of tightness</li> </ul>	<ul style="list-style-type: none"> <li>not as strong as a welded joint</li> <li>may not have appropriate tool for head type</li> <li>large variety of sizes and thread types can make it difficult to replace</li> </ul>
Accept other relevant answers.		

- (b) Define galvanising and state a reason why a fastener might need to be galvanised. (2 marks)

Description	Marks
Defines galvanising	1
States a reason why a fastener might need to be galvanised	1
<b>Total</b>	<b>2</b>
Answers could include: Galvanising is the process of applying a protective zinc coating to steel. A fastener may need to be galvanised to prevent rusting, particularly for outdoor use. Accept other relevant answers.	

**Question 15**

**(22 marks)**

- (a) In the space below, create **three** annotated rapid concept sketches. Each sketch must address **one** of the design issues described on page 20. (12 marks)

Description	Marks
For each of the three rapid concept sketches (3 × 2 marks)	
Detailed rapid concept sketch addressing the specified design issues	2
Legible sketch addressing some of the specified design issues	1
<b>Subtotal</b>	<b>6</b>
For the annotations on each of the three rapid concept sketches (3 × 2 marks)	
Detailed annotations	2
Limited annotations	1
<b>Subtotal</b>	<b>6</b>
<b>Total</b>	<b>12</b>
Possible solutions include:	
<ul style="list-style-type: none"> <li>• larger rack for more shoes, for example longer or taller (tiered shelves)</li> <li>• compartments for shoes to prevent them falling off</li> <li>• incorporation of a traditional (historic) aesthetic, with use of embellishments such as scroll work.</li> </ul>	
Accept other relevant answers.	

- (b) Justify **one** of your design concepts from part (a) using **six** design fundamentals. (6 marks)

Description	Marks
Justifies one design concept using six design fundamentals	6
Discusses one design concept using six design fundamentals	5
Explains one design concept using some design fundamentals	4
Describes design concept using some design fundamentals	3
Outlines design fundamentals in one design concept	2
Makes a general statement about the design fundamentals	1
<b>Total</b>	<b>6</b>
Answers could include:	
<ul style="list-style-type: none"> <li>• aesthetics – the concept incorporates the use of scroll work to appeal to a client who has a traditional style in their home</li> <li>• function – the shelves in the rack are angled to allow the shoes to be seen and accessed easier</li> <li>• safety – the rack has no sharp edges to prevent the user from hurting themselves</li> <li>• cost – the rack is a bespoke piece of work and therefore is more expensive than a mass – produced rack. It is designed to appeal to a premium market</li> <li>• environmental impact – materials can be recycled at end of use</li> <li>• sustainability issues – materials can be sourced from a scrap metal merchant and re-used</li> <li>• ergonomics – the rack is designed to allow the client to easily place a shoe in and take out when required</li> <li>• anthropometric data – average foot size has been considered when designing the size of the rack.</li> </ul>	
Accept other relevant answers.	

- (c) Identify **two** characteristics of the material shown in the image on page 20. (2 marks)

Description	Marks
Identifies a characteristic of the materials in the shoe rack	1
<b>Total</b>	<b>2</b>
Answers could include: Characteristics: <ul style="list-style-type: none"> <li>• has a high strength – weight ratio</li> <li>• comes in various sizes and sections, e.g. square, rectangular, round</li> <li>• relatively low cost</li> <li>• easy to weld</li> <li>• high dimensional tolerance</li> <li>• is made from seam welding</li> <li>• comes in different surface finishes, e.g. bare, zinc, oiled, painted.</li> </ul>	
Accept other relevant answers.	

- (d) Describe how the finish of the shoe rack shown on page 20 is achieved. (2 marks)

Description	Marks
Describes how the finish of the shoe rack is achieved	2
Makes a general statement about how the finish of the shoe rack is achieved	1
<b>Total</b>	<b>2</b>
Answers could include: Powder coating uses finely ground particles of pigment and resin that are electrostatically charged and sprayed onto electrically grounded parts. The charged powder particles adhere to the part which is then cured in an oven.	
Accept other relevant answers.	

**Question 16**

**(12 marks)**

- (a) Define what is meant by the term 'ferrous'. (1 mark)

Description	Marks
Defines the term ferrous	1
<b>Total</b>	<b>1</b>
Answers could include: A ferrous metal has the element Iron in its composition. Accept other relevant answers.	

- (b) Define the term 'alloy' and state **two** advantages of using an alloy. (3 marks)

Description	Marks
Defines the term alloy	1
For each of the two advantages	
States an advantage of using alloy	1
<b>Subtotal</b>	<b>2</b>
<b>Total</b>	<b>3</b>
Answers could include: An alloy is a mixture of a metal with another element, either metal or non-metal. Advantages: <ul style="list-style-type: none"> <li>• alloys are stronger than pure metals</li> <li>• enhanced tensile strength</li> <li>• modify colour</li> <li>• resistant to corrosion.</li> </ul> Accept other relevant answers.	

- (c) (i) Describe the process of hardening the screwdriver blade. (2 marks)

Description	Marks
Describes the process of hardening the screwdriver blade	2
Makes a general statement about the process of hardening the screwdriver blade	1
<b>Total</b>	<b>2</b>
Answers could include: Heating the blade to cherry red colour and quenching in water or oil. Accept other relevant answers.	

- (ii) Describe the resulting physical changes to the metal after tempering. (2 marks)

Description	Marks
Describes the resulting physical changes after tempering	2
Makes a general statement about the resulting physical changes after tempering	1
<b>Total</b>	<b>2</b>
Answers could include: <ul style="list-style-type: none"> <li>• increased toughness</li> <li>• reduced brittleness</li> <li>• reducing internal stresses.</li> </ul> Accept other relevant answers.	



- (d) Describe the process you would use to cut the internal thread in the handle, using appropriate workshop terminology. (2 marks)

Description	Marks
Describes the process to cut the internal thread in the handle with use of applying appropriate terminology	2
Makes a general statement about the process to cut the internal thread in the handle	1
<b>Total</b>	<b>2</b>
Answers could include: <ul style="list-style-type: none"> <li>• drill hole</li> <li>• place tap in tap wrench and apply lubricant</li> <li>• turn tap clockwise to cut threads</li> <li>• for every full rotation clockwise, make a half turn counter clockwise to break off metal chips (swarf).</li> </ul>	
Accept other relevant answers.	

- (e) Describe the process you would use to cut the external thread on the blade, using appropriate workshop terminology. (2 marks)

Description	Marks
Describes the process to cut the external thread in the handle, applying appropriate terminology	2
Makes a general statement about the process to cut the external thread in the handle	1
<b>Total</b>	<b>2</b>
Answers could include: <ul style="list-style-type: none"> <li>• hold work piece in vice or lathe chuck</li> <li>• place die in die wrench. Apply lubricant. Turn tap clockwise to cut threads</li> <li>• for every full rotation clockwise, make a half turn counter clockwise to break off metal chips (swarf).</li> </ul>	
Accept other relevant answers.	

**Question 17**

**(10 marks)**

Using the drawings, parts and price lists, complete the costing table for making a **single** brick carrier. Round costs to the nearest cent. All sizes to be in millimetres (mm).

<b>Description</b>					<b>Marks</b>
One mark for each correct calculation					1–10
<b>Total</b>					<b>10</b>
<b>Part name</b>	<b>Material description</b>	<b>Number required</b>	<b>Total length required (mm)</b>	<b>Cost (\$/m)</b>	<b>Cost</b>
Bar	32 x 6 Mild steel flatbar	1	<b>482</b>	\$27.14	<b>\$13.08</b>
Jaw	102 x 76 x 6.5 Unequal angle	<b>2</b>	<b>120</b>	\$110.00	\$13.20
Finger plate	25 x 3 Mild steel flatbar	1	150	<b>\$11.72</b>	<b>\$ 1.76</b>
Lever	32 x 6 Mild steel flatbar	2	<b>244</b> or <b>212</b>	\$27.14	<b>\$ 6.62</b> or <b>\$ 5.75</b>
Handle	DIA 26.9 x 2.6 Steel pipe	1	<b>260</b>	\$ 6.43	<b>\$ 1.67</b>
Hexagon head bolt	N/A	1	N/A	\$ 0.20	\$ 0.20
Hexagon nyloc nut	N/A	1	N/A	\$ 0.20	\$ 0.20

Question 18

(14 marks)

(a) Define the term 'globalisation'.

(2 marks)

Description	Marks
Defines the term globalisation	2
Makes a general statement about globalisation	1
<b>Total</b>	<b>2</b>
Answers could include: Definition: Globalisation is the process whereby local, national and international economies and cultures are linked through a network of trade, communication and transport. Accept other relevant answers.	

(b) Review the specifications of the above coffee table and outline **three** impacts of globalisation affecting its production.

(6 marks)

Description	Marks
For each of the three impacts (3 × 2 marks)	
Outlines the impact of globalisation affecting the production of the coffee table	2
Makes a general statement about the impact of globalisation	1
<b>Total</b>	<b>6</b>
Answers could include: Globalisation has a broad impact on people, cultures and the environment: <ul style="list-style-type: none"> <li>• the coffee table is made in China where labour is cheaper, thus creating cheaper products and bigger profit margins</li> <li>• it is produced in ethical factories, but countries are often less strict about human rights and child labour and safety standards can be ignored. Thus, big corporations can act with less accountability.</li> <li>• overseas production can cause the decline of local manufacturing due to high price of Australian dollar (raising the price of steel exports) and reducing jobs available locally</li> <li>• Chinese steel producers are enhancing production facilities, to enable production of higher-grade products which were traditionally imported from Europe</li> <li>• globalisation allows easier access to primary resources for materials and for designers to access materials unavailable in their homeland</li> <li>• globalisation can create bonding of people across countries where collaboration occurs. This can lead to the development of further projects with benefits for both communities.</li> <li>• globalisation can transmit cultures and traditions readily. Conversely, with Australian styles and designs being introduced to manufacturing countries consumers in those countries can lose their own heritage and local styles/goods, becoming more westernised as global companies move in.</li> <li>• the movement of designs globally causes piracy of designs, stealing of intellectual property and improper appropriation of cultures, icons and identities</li> <li>• the increased transport between China and WA causes increased air and ocean pollution</li> <li>• globalisation makes social networking to advertise and market goods easier and more effective</li> <li>• scamming and spamming people with fakes</li> <li>• more investment in developing countries.</li> </ul> Accept other relevant answers.	

**Question 18** (continued)

- (c) Discuss how green design principles can be incorporated into the design and production of the coffee table. (6 marks)

Description	Marks
Discusses how green design principles can be incorporated into the design and production of the coffee table	6
Explains how green design principles can be incorporated into the design and production of the coffee table	5
Describes how two or more green design principles can be incorporated into the design and production of the coffee table	4
Outlines how two or more green design principles can be incorporated into the design and production of the coffee table	3
Outlines green design principles	2
Makes general statements about green design principles	1
<b>Total</b>	<b>6</b>
<p>Answers could include:</p> <p>Efficient use of energy and materials:</p> <ul style="list-style-type: none"> <li>• using green materials as an alternative</li> <li>• using materials from sustainable sources</li> <li>• using less materials in each product</li> <li>• reduce number of processes used to make a product</li> <li>• minimise waste during production</li> <li>• reduce packaging</li> <li>• use renewable energy.</li> </ul> <p>Pollution and waste reduction:</p> <ul style="list-style-type: none"> <li>• minimise transport – manufacture close to the market</li> <li>• source materials locally to decrease transportation emissions</li> <li>• easily transported – lightweight/stackable/flatpack</li> <li>• improve energy efficiency of products</li> <li>• use more durable materials to increase lifespan of a product.</li> </ul> <p>Minimising waste at the end of the life of the product:</p> <ul style="list-style-type: none"> <li>• using recyclable materials</li> <li>• labelling of plastic components to assist recycling</li> <li>• use compostable packaging</li> <li>• consider how product will be disposed of/re-used/recycled.</li> </ul>	
Accept other relevant answers.	

## Question 19

(8 marks)

Discuss how human factors have affected the development of manufacturing processes.

Description	Marks
Discusses how human factors have affected the development of manufacturing processes	7–8
Explains how human factors have affected the development of manufacturing processes	5–6
Describes some ways human factors have affected the development of manufacturing processes	3–4
Outlines ways human factors have affected the development of manufacturing processes	2
Makes a general statement about human factor/s in the workplace	1
<b>Total</b>	<b>8</b>
<p>Answers could include:</p> <p>Manufacturing processes have been designed by humans to include the interaction of humans with machinery and processes. Human factors affect manufacturing processes in positive and negative ways. Humans have continually created new materials, products and process, and they have refined manufacturing processes to be faster, safer, more efficient and more profitable. As manufacturing processes require human skills, they must be designed to suit the needs of the workforce.</p> <p>Human factors influence where work is done, the way that work is carried out and the productivity of companies. Human requirements affect the design of buildings, machinery and manufacturing processes, and the type of materials used for products. Human factors have a limiting effect on manufacturing processes; humans get injured, make mistakes, forget, need holidays, get sick and take leave for a range of reasons. Manufacturers have developed processes to minimise the impact of these factors. The use of automation and robot technologies have replaced work done by humans that was unsafe, pressured, slow, tedious, repetitive and unhealthy.</p> <p>Governments legislate to protect and support human resources, so manufacturing processes have developed to meet these requirements. Workplaces must now have a safe and healthy physical environment with correct lighting, ventilation, noise levels, hygiene, ergonomic setup (work benches, equipment, seating, etc.), room temperature, lifting and safety equipment, so manufacturing processes have been developed to meet these needs.</p> <p>As society changes manufacturing processes develop to keep pace. Change in demand for goods and changes in social values, such as the focus on human rights and ethical treatment of workers, cause manufacturing processes to change. Changes in manufacturing processes leads to increased need for training and upskilling of the workforce.</p> <p>Accept other relevant answers.</p>	

**Section Three: Textiles context**

**60% (77 Marks)**

**Question 20**

**(11 marks)**

- (a) In the table below, name each of the fabric structures and list **one** advantage and **one** disadvantage of each fabric structure. (9 marks)

Description		Marks
One mark for each correct answer		1–9
<b>Total</b>		<b>9</b>
Answers could include:		
Fabric structure	Advantage	Disadvantage
Woven	<ul style="list-style-type: none"> <li>• strong, durable, stable, breathable</li> <li>• cost effective</li> <li>• can be applied to all fibres</li> <li>• widely available in many fibres, textures, colours</li> <li>• a range of weights for different end uses</li> <li>• high dimensional stability</li> <li>• higher abrasion resistance</li> <li>• easy to sew</li> </ul>	<ul style="list-style-type: none"> <li>• doesn't stretch</li> <li>• can restrict possible designs</li> <li>• frays</li> </ul>
knit/Weft knit	<ul style="list-style-type: none"> <li>• drapes well</li> <li>• soft texture, comfortable to wear</li> <li>• stretches, high flexibility</li> <li>• breathable, absorbent</li> <li>• high crease resistance</li> <li>• a range of weights for different end uses</li> <li>• wide range of possible designs</li> <li>• seamless technology to reduce manufacturing processes</li> <li>• doesn't fray</li> </ul>	<ul style="list-style-type: none"> <li>• stretches</li> <li>• shrinks easily</li> <li>• less durable than woven</li> <li>• less dimensional stability</li> <li>• poor abrasion resistance – pilling</li> <li>• hard to sew</li> </ul>
Non-woven	<ul style="list-style-type: none"> <li>• stable</li> <li>• wide range of types for end uses</li> <li>• fast production, high yield, low-cost wide use</li> <li>• many sources of raw materials</li> </ul>	<ul style="list-style-type: none"> <li>• doesn't stretch</li> <li>• strength and durability are poor</li> <li>• cannot be cleaned like other fabrics</li> <li>• fibres are arranged in a certain direction so are easy to split at right angles</li> </ul>
Accept other relevant answers.		

- (b) Outline the connection between a fabric's structure, properties and end use in its selection for a manufactured product. (2 marks)

Description	Marks
Outlines the connection between a fabric's structure, properties and end use	2
Makes a general statement about the connection between a fabric's structure, properties and end use	1
<b>Total</b>	<b>2</b>
Answers could include: The structure and properties determine how the fabric functions, its aesthetics, its care, how it can be processed and how it can be disposed of. A designer will seek the best match of these factors with the design needs when selecting fabric for the end use.	
Accept other relevant answers.	

**Question 21**

**(22 marks)**

- (a) In the space below, create **three** annotated rapid concept sketches. Each sketch must address **one** of the design issues described on page 34. (12 marks)

Description	Marks
For each of the three rapid concept sketches (3 × 2 marks)	
Detailed rapid concept sketch addressing the specified design issues	2
Legible sketch addressing some of the specified design issues	1
<b>Subtotal</b>	<b>6</b>
For the annotations on each of the three rapid concept sketches (3 × 2 marks)	
Detailed annotations	2
Limited annotations	1
<b>Subtotal</b>	<b>6</b>
<b>Total</b>	<b>12</b>
Possible solutions include:	
<ul style="list-style-type: none"> <li>• replace buttons with a zipper</li> <li>• insert a cord into the front of the hood</li> <li>• use cultural/subcultural patterns.</li> </ul>	
Accept other relevant answers.	

- (b) Justify **one** of your design concepts from part (a) using **six** design fundamentals. (6 marks)

Description	Marks
Justifies one design concept using six design fundamentals	6
Discusses one design concept using six design fundamentals	5
Explains one design concept using some design fundamentals	4
Describes design concept using some design fundamentals	3
Outlines design fundamentals in one design concept	2
Makes a general statement about the design fundamentals	1
<b>Total</b>	<b>6</b>
Answers could include:	
<ul style="list-style-type: none"> <li>• aesthetics – changing the colour, adding patterns and coloured panels and pockets inspired by a theme</li> <li>• function – replace buttons with zipper in the centre front, cord in the hood to stop it blowing off</li> <li>• safety – maintain bright colour for high visibility</li> <li>• cost – can maintain low cost by keeping the same fabrics</li> <li>• environmental impact – materials can be recycled at end of use</li> <li>• sustainability issues – use organic cotton or bamboo, plastic recycled from PET bottles</li> <li>• ergonomics – comfortable fit, light-weight, easy to put on and do up</li> <li>• anthropometric data – used to size correctly and make fit well.</li> </ul>	
Accept other relevant answers.	



- (c) Identify **two** characteristics of the morphology of the cotton fibre used for the lining of the raincoat. (2 marks)

Description	Marks
For each characteristic	
Identifies a characteristic of the morphology of the cotton fibre	1
<b>Total</b>	<b>2</b>
Answers could include: Characteristics: <ul style="list-style-type: none"> <li>cellulose, crystalline polymers, plant, microscopic appearance is kidney shaped, lightweight, absorbent, soft, off-white, staple fibre.</li> </ul> Accept other relevant answers.	

- (d) Describe **one** embellishment technique that could be used to enhance the aesthetics of the raincoat. (2 marks)

Description	Marks
Describes one embellishment technique that could be used to enhance the aesthetics of the raincoat	2
Makes a general statement about one embellishment technique that could be used to enhance the aesthetics of the raincoat	1
<b>Total</b>	<b>2</b>
Answers could include: Printing, applique, dyeing, stitching, embroidery, patchwork. e.g. Applique is a technique where pieces of patterned or contrasting colour fabric, or decorative materials such as ribbon, are stitched onto a base fabric, such as the body of the rain coat to enhance the aesthetics.	
Accept other relevant answers.	

**Question 22**

**(12 marks)**

- (a) Define what is meant by the term ‘regenerated fibre’. (1 mark)

Description	Marks
Defines the term regenerated fibre	1
<b>Total</b>	<b>1</b>
Answers could include: Regenerated fibre is created by dissolving the cellulose area of plant fibre in chemicals and making it into fibre. Accept other relevant answers.	

- (b) Identify **one** method used to blend fibres and state **two** advantages of using a blended fibre. (3 marks)

Description	Marks
Identifies correct method	1
For each of the two advantages	
States a correct advantage	1
<b>Subtotal</b>	<b>2</b>
<b>Total</b>	<b>3</b>
Answers could include: Methods: intimate blend, composite blend, mixture blend. Advantages: <ul style="list-style-type: none"> <li>• gains the beneficial properties of each of the individual fibres in the blend</li> <li>• improved functional properties: stronger, crease resistant, more absorbent, less absorbent, abrasion resistant</li> <li>• improved aesthetic properties: drape, handle, lustre</li> <li>• improved process performance, more economic, fancy effects.</li> </ul> Accept other relevant answers.	

- (c) (i) Name **two** types of yarn structure. (2 marks)

Description	Marks
One mark for each correct type of yarn structure	1–2
<b>Total</b>	<b>2</b>
Answers could include: <ul style="list-style-type: none"> <li>• Spun staple</li> <li>• Filament – monofilament, multifilament</li> <li>• Novelty yarn.</li> </ul> Accept other relevant answers.	

- (ii) Identify the **most** important factor in determining the properties of yarns and state how it impacts the yarn. (2 marks)

Description	Marks
Identifies the most important factor in determining the properties of yarns	1
Makes a general statement about the impacts the yarns	1
<b>Total</b>	<b>2</b>
Answers could include: The most important factor is the twist. It strengthens the yarn: high twist is stronger, low twist is weaker/softer. Accept other relevant answers.	

- (d) Describe why the designer would choose to make the dress with rayon jersey knit fabric by identifying **two** properties in your response. (2 marks)

Description	Marks
Describes why the designer would choose to make the dress with rayon jersey knit fabric including two properties	2
Makes a general statement about why the designer would choose to make the dress with rayon jersey knit fabric, including any properties	1
<b>Total</b>	<b>2</b>
Answers could include: All of the properties of rayon jersey knit fabric, which are: soft handle, good drape, elasticity, and high moisture absorbency (making it easily dyed in vivid colours) match well with the design needs of the dress. It is versatile, wrinkle resistant, durable, breathable and comfortable making it desirable to a consumer. Accept other relevant answers.	

- (e) Name and outline **one** finish that would be suitable. (2 marks)

Description	Marks
Names a suitable finish	1
Outlines how the finish would be suitable	1
<b>Total</b>	<b>2</b>
Answers could include: <ul style="list-style-type: none"> <li>• anti-microbials, anti-bacterials to prevent odour and deter attack from bacteria</li> <li>• fluoro chemistry to prevent staining and dirt build up to improve durability</li> <li>• wrinkle resistance, anti-static, anti-pilling, calendaring to improve appearance of fabric</li> <li>• sunlight resistance, colourfastness, to increase durability.</li> </ul> Accept other relevant answers.	

### Question 23

(10 marks)

Using the image, materials list and materials price list, complete the costing table for making the 1965 Mondrian dress. Round costs to the nearest cent.

Description	Marks		
One mark for each correct calculation	1–10		
<b>Total</b>	<b>10</b>		
Answers:			
<b>Costing</b>			
Materials	Quantity	Cost per unit	Cost
Wool fabric	1.30 m	\$25.60	<b>\$33.28</b>
Polyester fabric	2.20 m	\$10.75	<b>\$23.65</b>
Acetate lining	2.20 m	\$ 8.99	<b>\$19.78</b>
Interfacing	60 cm	\$ 2.85	<b>\$ 1.71</b>
55 cm nylon zip	1	\$ 5.25	<b>\$ 5.25</b>
Thread cones	4	\$ 3.40	<b>\$13.60</b>
<b>Total</b>			<b>\$97.27</b>

**Question 24**

**(14 marks)**

- (a) Define the term 'globalisation'. (2 marks)

Description	Marks
Defines the term globalisation	2
Makes a general statement about globalisation	1
<b>Total</b>	<b>2</b>
Answers could include: Definition: Globalisation is the process whereby local, national and international economies and cultures are linked through a network of trade, communication and transport. Accept other relevant answers.	

- (b) Review the specifications of the above board shorts and outline **three** impacts of globalisation affecting their production. (6 marks)

Description	Marks
For each of the three impacts (3 × 2 marks)	
Outlines the impact of globalisation affecting the production of the board shorts	2
Makes a general statement about the impact of the globalisation	1
<b>Total</b>	<b>6</b>
Answers could include: Globalisation has a broad impact on people, cultures and the environment: <ul style="list-style-type: none"> <li>the board shorts are made in China where labour is cheaper, thus creating cheaper products and bigger profit margins. These board shorts are produced in ethical factories, but countries are often less strict about human rights and child labour and safety standards can be ignored. Thus, big corporations can act with less accountability.</li> <li>globalisation allows easier access to primary resources for materials and for designers to access materials unavailable in their homeland. The environmentally friendly PET fabric is not manufactured in Australia, so must be sourced overseas if the benefits of this fabric are to be incorporated into the Australian swimwear market.</li> <li>globalisation can create bonding of people across countries where collaboration occurs. This can lead to the development of further projects with benefits for both communities.</li> <li>globalisation can transmit cultures and traditions readily. Conversely, with Australian board short styles and prints on the fabric being introduced to manufacturing countries consumers in those countries can lose their own heritage and local styles/goods, becoming more westernised as global companies move in.</li> <li>the movement of designs globally causes piracy of designs, stealing of intellectual property and improper appropriation of cultures, icons and identities.</li> </ul> Environmental challenges: <ul style="list-style-type: none"> <li>the increased transport between Italy, China and WA causes increased air and ocean pollution</li> <li>globalisation makes social networking to advertise and market goods easier and more effective</li> <li>scamming and spamming people with fakes</li> <li>more investment in developing countries.</li> </ul> Accept other relevant answers.	

- (c) Discuss how green design principles can be incorporated into the design and production of the board shorts. (6 marks)

Description	Marks
Discusses how green design principles can be incorporated into the design and production of the board shorts	6
Explains how green design principles can be incorporated into the design and production of the board shorts	5
Describes how two or more green design principles can be incorporated into the design and production of the board shorts	4
Outlines how two or more green design principles can be incorporated into the design and production of the board shorts	3
Outlines green design principles	2
Makes general statements about green design principles	1
<b>Total</b>	<b>6</b>
<p>Answers could include:</p> <p>Efficient use of energy and materials:</p> <ul style="list-style-type: none"> <li>• using green materials as an alternative</li> <li>• using materials from sustainable sources</li> <li>• using less materials in each product</li> <li>• reduce number of processes used to make products</li> <li>• minimise waste during production</li> <li>• reduce packaging</li> <li>• use renewable energy.</li> </ul> <p>Pollution and waste reduction:</p> <ul style="list-style-type: none"> <li>• minimise transport – manufacture close to the market</li> <li>• source materials locally to decrease transportation emissions</li> <li>• easily transported – lightweight/stackable/flatpack</li> <li>• improve energy efficiency of product</li> <li>• use more durable materials to increase lifespan of product.</li> </ul> <p>Minimising waste at the end of the life of the product:</p> <ul style="list-style-type: none"> <li>• using recyclable materials</li> <li>• labelling of plastic components to assist recycling</li> <li>• use compostable packaging</li> <li>• consider how the product will be disposed of/re-used/recycled.</li> </ul> <p>Accept other relevant answers.</p>	

**Question 25**

**(8 marks)**

Discuss how human factors have affected the development of manufacturing processes.

Description	Marks
Discusses how human factors have affected the development of manufacturing processes	7–8
Explains how human factors have affected the development of manufacturing processes	5–6
Describes some ways human factors have affected the development of manufacturing processes	3–4
Outlines ways human factors have affected the development of manufacturing processes	2
Makes a general statement about human factor/s in the workplace	1
<b>Total</b>	<b>8</b>
<p>Answers could include:</p> <p>Manufacturing processes have been designed by humans to include the interaction of humans with machinery and processes. Human factors affect manufacturing processes in positive and negative ways. Humans have continually created new materials, products and process, and they have refined manufacturing processes to be faster, safer, more efficient and more profitable. As manufacturing processes require human skills, they must be designed to suit the needs of the workforce.</p> <p>Human factors influence where work is done, the way that work is carried out and the productivity of companies. Human requirements affect the design of buildings, machinery and manufacturing processes, and the type of materials used for products. Human factors have a limiting effect on manufacturing processes; humans get injured, make mistakes, forget, need holidays, get sick and take leave for a range of reasons. Manufacturers have developed processes to minimise the impact of these factors. The use of automation and robot technologies have replaced work done by humans that was unsafe, pressured, slow, tedious, repetitive and unhealthy.</p> <p>Governments legislate to protect and support human resources, so manufacturing processes have developed to meet these requirements. Workplaces must now have a safe and healthy physical environment with correct lighting, ventilation, noise levels, hygiene, ergonomic setup (work benches, equipment, seating, etc.), room temperature, lifting and safety equipment, so manufacturing processes have been developed to meet these needs.</p> <p>As society changes manufacturing processes develop to keep pace. Change in demand for goods and changes in social values, such as the focus on human rights and ethical treatment of workers, cause manufacturing processes to change. Changes in manufacturing processes leads to increased need for training and upskilling of the workforce.</p> <p>Accept other relevant answers.</p>	

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- Question 4(b)** Adapted from: Business Australia. (n.d.). *Undertake WHS risk management with these four steps: Hierarchy of control for risk*. Retrieved September, 2021, from <https://www.businessaustralia.com/how-we-help/be-a-better-employer/managing-risk/undertake-whs-risk-management-with-these-four-steps>
- Question 4(c)** Adapted from: Safe Work Australia. (2020). *Safety data sheets: Information to include in safety data sheets*. Retrieved September, 2021, from <https://www.safeworkaustralia.gov.au/sds#information-to-include-in-safety>  
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