



## ATAR course examination, 2020

### Question/Answer booklet

# MATERIALS DESIGN AND TECHNOLOGY

## Section Three

Please place your student identification label in this box

WA student number: In figures

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In words

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### Time suggested for this section

Suggested working time for this section: ninety minutes

### Materials required for this section

*To be provided by the supervisor*

This Question/Answer booklet

### *To be provided by the candidate*

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination

Place a tick (✓) in one of the following boxes to indicate your examination context

Wood

Metal

Textiles

Number of additional answer booklets used (if applicable):

### Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## Structure of the examination

The Materials Design and Technology ATAR course examination consists of a written component and a practical (portfolio) component.

## Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of written examination
Section One Short answer	3	3	20	41	15
Section Two Extended answer	4	4	40	36	25
Section Three Candidates to choose <b>one</b> of the following contexts: Wood Metal Textiles	6	6	90	72	60
<b>Total</b>					100

## Instructions to candidates

- The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2020: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in this Question/Answer booklet.
- Answer the questions according to the following instructions.  
  
Section Three: Answer all of the questions within your context: Wood, Metal or Textiles.
- You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
- Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

**Section Three: Sectionalised and extended answer****60% (72 Marks)**

You are required to choose **one** of the following options, according to the context you have studied in 2020.

Tick one of the boxes below to indicate your choice of context.

<b>Context</b>	<b>✓</b>	<b>Question</b>	<b>Pages</b>
<b>Wood</b>	<input type="checkbox"/>	8–13	4–17
<b>Metal</b>	<input type="checkbox"/>	14–19	18–31
<b>Textiles</b>	<input type="checkbox"/>	20–25	32–45

Now turn to the relevant pages and answer the questions for the context you have studied.

Section Three: Wood context

60% (72 Marks)

This section contains **six** questions. Answer **all** questions.

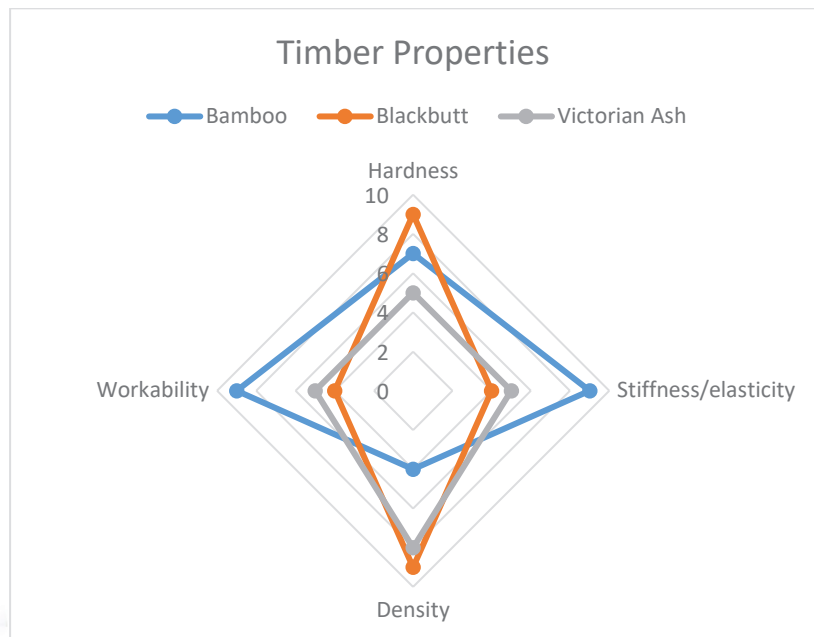
Suggested working time: 90 minutes.

Question 8

(18 marks)

The designer of this chair has used the processes of steam bending and laminating to create the curves and twists in the timber pieces. Consider this information and the data in the radar chart below when answering the question parts.

For copyright reasons this image cannot be reproduced in the online version of this document, but may be viewed at the link listed on the acknowledgements page.



- (a) With reference to the radar chart, identify which timber would be most suitable for this chair and justify your selection against the other timbers available. (5 marks)

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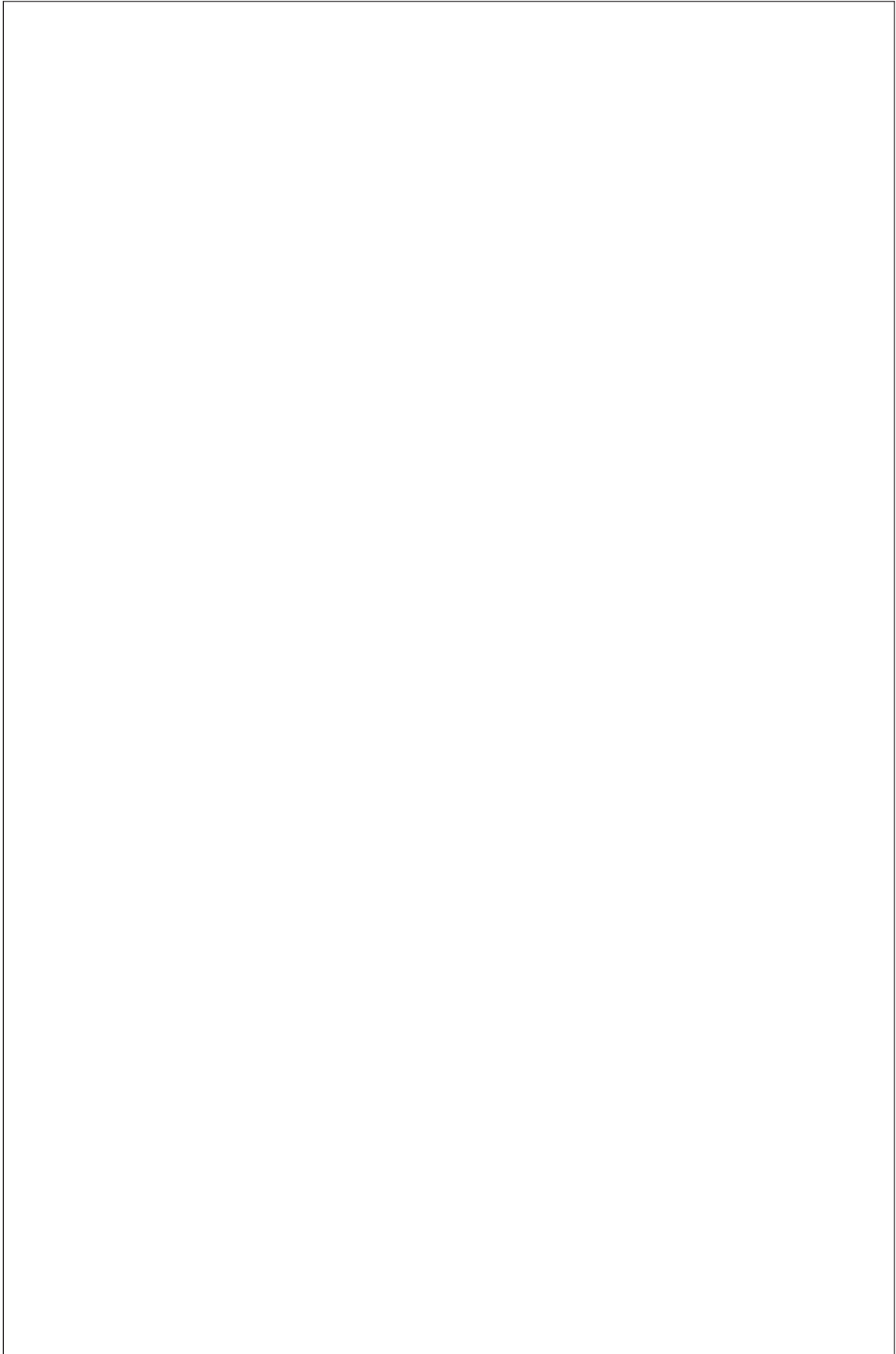
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- (b) Select **one** of the four properties from the radar chart and in the space below sketch and annotate a method for testing that property. (6 marks)



**Question 8** (continued)

- (c) Outline **three** factors you must consider to ensure reliability of test results. (3 marks)

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- (d) Identify an adhesive and explain the properties that make it most suitable to laminate the pieces of timber together to make the curves. (4 marks)

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**Question 9**

**(9 marks)**

Health and safety is a priority when using the machine pictured.



Pedestal drill

- (a) Outline **three** safety checks that should be carried out on the machine before switching it on. **(3 marks)**

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- (b) A student is using a 30 mm Forstner bit to drill a hole and wants to stop drilling at a depth of 20 mm. Describe how this process could be completed accurately. (2 marks)

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- (c) Outline **four** strategies that a company could implement to establish and maintain a safe work culture. (4 marks)

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Question 10

(16 marks)

- (a) Complete the table for **three** finishes and state how it enhances and protects the appearance of timber. (6 marks)

Name of finish	Enhance and protect the timber

- (b) Using an example, outline **three** ways in which finishes add value to products. (4 marks)

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- (c) The development of new materials impacts how products can be used by designers and consumers. Explain **two** ways in which new materials generate innovation and create new design possibilities. (6 marks)

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**Question 11**

**(11 marks)**

A small-scale manufacturer has purchased new CNC technology for their furniture-making workshop.

- (a) Define the term CNC. (2 marks)

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- (b) List **three** advantages and **three** disadvantages to the manufacturer of investing in this new technology. (6 marks)

<b>Advantages</b>	<b>Disadvantages</b>
One: _____ _____ _____ _____ _____	One: _____ _____ _____ _____ _____
Two: _____ _____ _____ _____ _____	Two: _____ _____ _____ _____ _____
Three: _____ _____ _____ _____ _____	Three: _____ _____ _____ _____ _____

(c) Identify **one** CNC machine used in the furniture-making industry and explain how it works. (3 marks)

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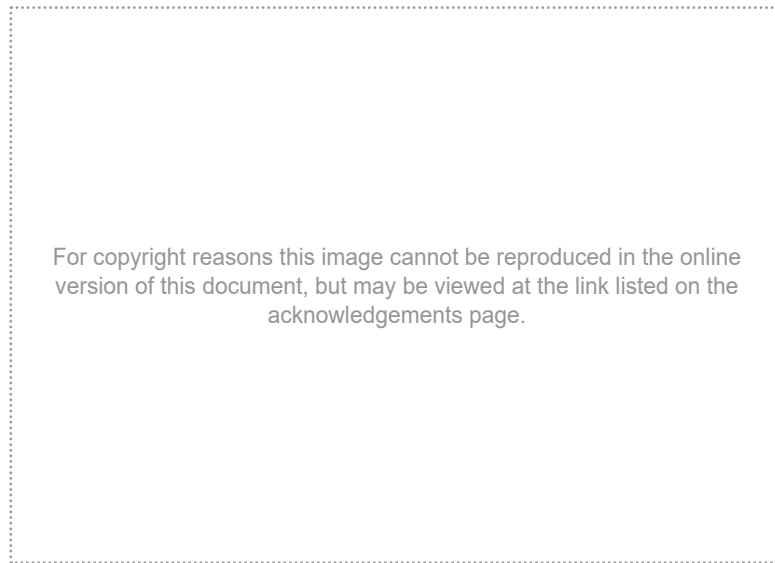
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**Question 12**

**(8 marks)**

The hall table shown below is made of 42 x 42 DAR pine.



- (a) The pine is available from several suppliers. Complete the table below to calculate the cost per metre for each supplier. Round the costs to the nearest cent.

**(2 marks)**

<b>Supplier</b>	<b>Length size (metres)</b>	<b>Price per length</b>	<b>Cost per metre (\$)</b>
A	3.6	\$17.40	\$4.83
B	3.6	\$18.51	
C	3.9	\$19.05	

- (b) The pine will be purchased from Supplier A. Complete the cutting list below and calculate the cost of the materials to manufacture the hall table. Round the costs to the nearest cent.

**(3 marks)**

**Material cutting/costing list**

<b>Part name</b>	<b>Number required</b>	<b>Length</b>	<b>Cost of part(s)</b>
Long rails	4	850 mm	
Short rails	4	200 mm	
Legs	4	762 mm	

The manufacturer has decided to produce the hall table in another size.

- (c) Complete the adjusted cutting list below and calculate the cost of the materials to manufacture the hall table. Round the costs to the nearest cent. (3 marks)

**Material cutting/costing list**

<b>Part name</b>	<b>Number required</b>	<b>Length</b>	<b>Cost of part(s)</b>
Long rails	4	1210 mm	
Short rails	4	250 mm	
Legs	4	790 mm	







Section Three: Metal Context

60% (72 Marks)

This section contains **six** questions. Answer **all** questions.

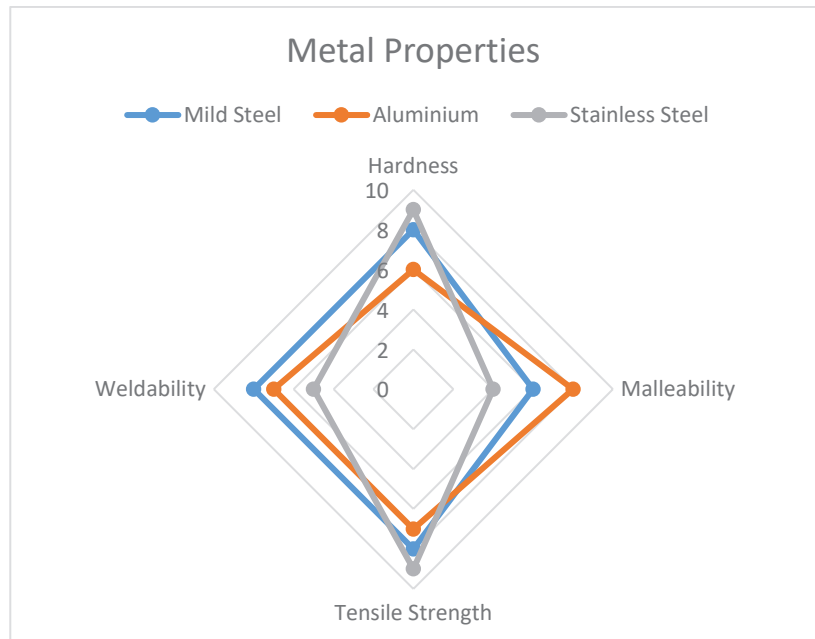
Suggested working time: 90 minutes.

Question 14

(18 marks)

The designer of this bar chair has used the process of tube bending to create the curves out of tubular metal section. Consider this information and the data in the radar chart below when answering the question parts.

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- (a) With reference to the radar chart, identify which metal would be most suitable for this chair and justify your selection against the other metals available. (5 marks)

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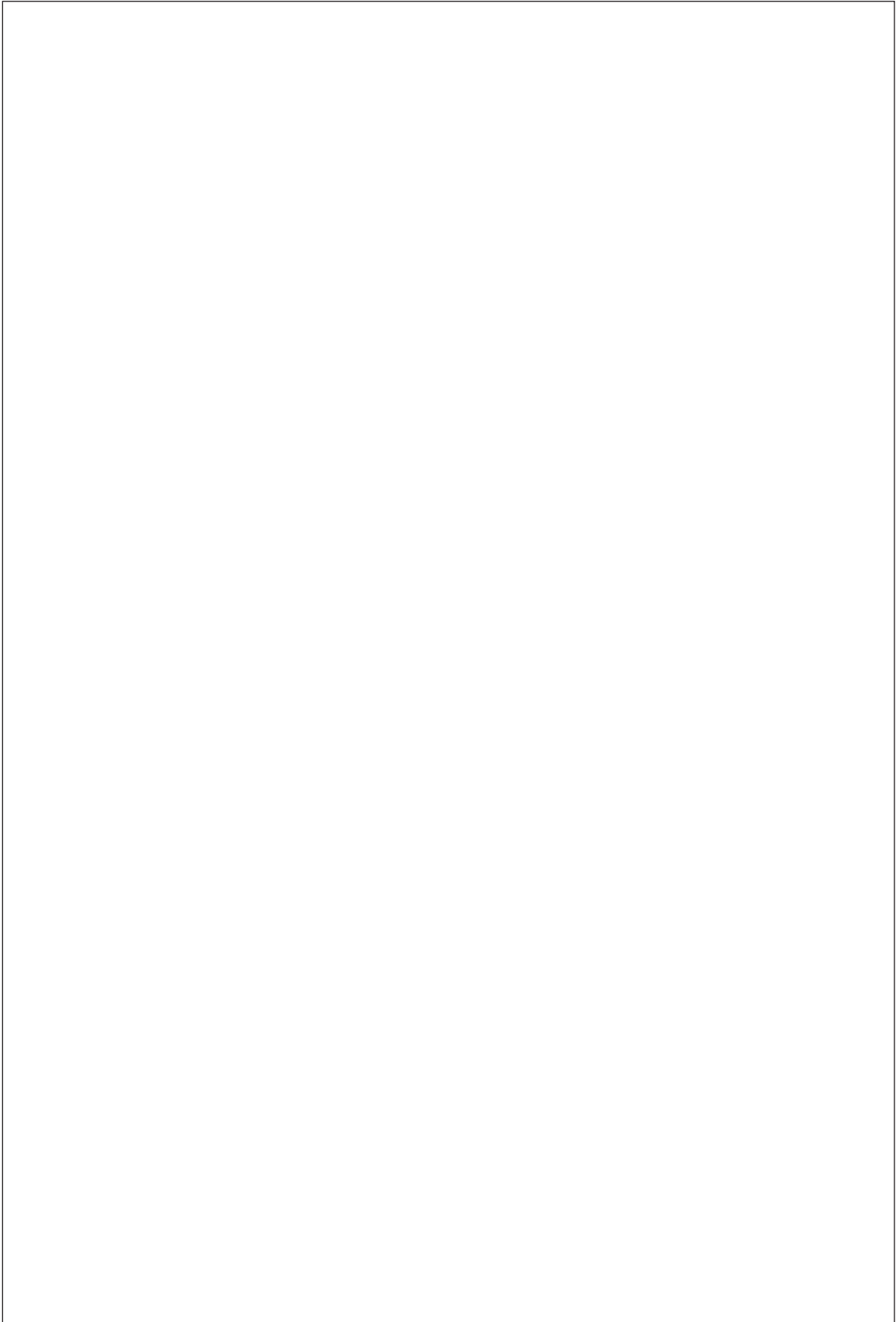
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- (b) Select **one** of the four properties from the radar chart and in the space below sketch and annotate a method for testing that property. (6 marks)



**Question 14** (continued)

- (c) Outline **three** factors you must consider to ensure reliability of test results. (3 marks)

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- (d) State a joining method for metal that would be suitable to manufacture the bar chair and identify **three** benefits of using this method over others. (4 marks)

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Question 15

(9 marks)

Health and safety is a priority when using the machine pictured.



Pedestal drill

- (a) Outline **three** safety checks that should be carried out on the machine before switching it on. (3 marks)

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- (b) A student is using the machine to drill a 10 mm diameter hole in 6 mm thick mild steel and notices that the drill bit overheats and does not cut properly. Describe how this problem could be overcome. (2 marks)

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- (c) Outline **four** strategies that a company could implement to establish and maintain a safe work culture. (4 marks)

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Question 16

(16 marks)

- (a) Complete the table for **three** finishes and state how it enhances and protects the appearance of the metal. (6 marks)

Name of finish	Enhance and protect the metal

- (b) Using an example, outline **three** ways in which finishes add value to products. (4 marks)

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Question 17

(11 marks)

A small-scale manufacturer has purchased new CNC technology for their metals fabrication workshop.

- (a) Define the term CNC. (2 marks)

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- (b) List **three** advantages and **three** disadvantages to the manufacturer of investing in this new technology. (6 marks)

Advantages	Disadvantages
One: _____ _____ _____ _____	One: _____ _____ _____ _____
Two: _____ _____ _____ _____	Two: _____ _____ _____ _____
Three: _____ _____ _____ _____	Three: _____ _____ _____ _____

- (c) Identify **one** CNC machine used in the metal-fabrication industry and explain how it works. (3 marks)

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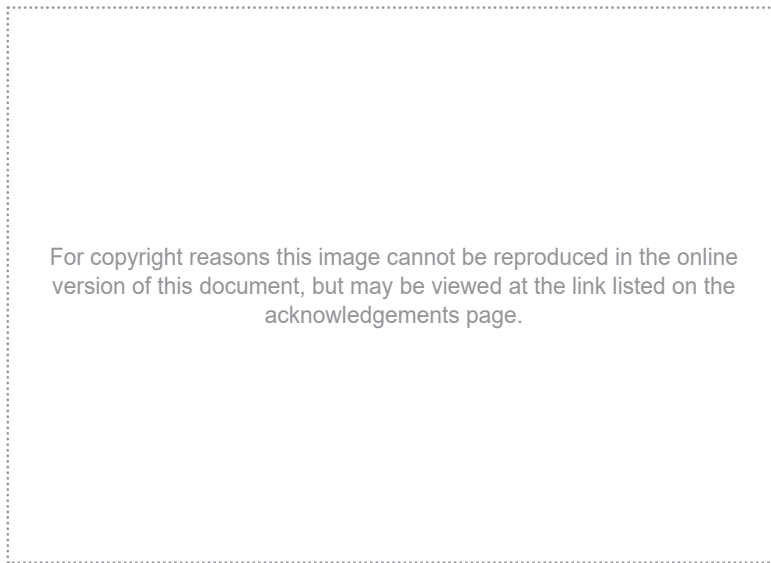
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**Question 18**

**(8 marks)**

The hall table shown below is made out of 20 x 20 ERW mild steel square tubing.



- (a) The tubular steel is available from several suppliers. Complete the table below to calculate the cost per metre for each supplier. Round the costs to the nearest cent. (2 marks)

Supplier	Length size (metres)	Price per length	Cost per metre (\$)
A	6.1	\$26.07	\$4.27
B	6.1	\$28.20	
C	6.5	\$29.90	

- (b) The tube will be purchased from Supplier A. Complete the cutting list below and calculate the cost of the materials to manufacture the hall table. Round the costs to the nearest cent. (3 marks)

**Material cutting/costing list**

Part name	Number required	Length	Cost of part(s)
Long rails	4	900 mm	
Short rails	4	200 mm	
Legs	4	762 mm	

The manufacturer has decided to produce the hall table in another size.

- (c) Complete the adjusted cutting list below and calculate the cost of the materials to manufacture the hall table. Round the costs to the nearest cent. (3 marks)

**Material cutting/costing list**

<b>Part name</b>	<b>Number required</b>	<b>Length</b>	<b>Cost of part(s)</b>
Long rails	4	1210 mm	
Short rails	4	250 mm	
Legs	4	790 mm	

Question 19

(10 marks)

The manufacture of goods has altered significantly and continues to grow and change. Companies design and use new technologies and materials to improve products, reduce costs and increase profits to be competitive. These innovations have changed the way humans are involved in manufacturing processes. In the global era, societal attitudes and standards of human rights and ethical work have changed.

Outline **five** ethical issues Australian manufacturers face and how they manage the ethical production of their goods.

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Section Three: Textiles context

60% (72 Marks)

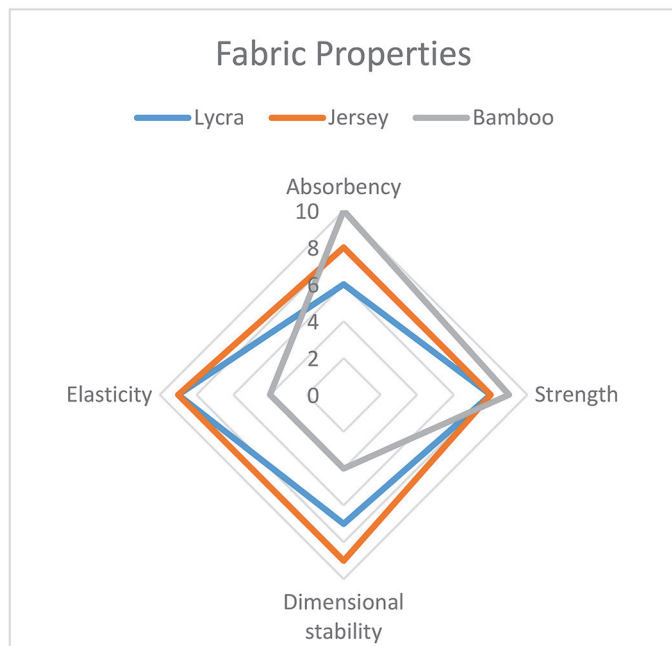
This section contains **six** questions. Answer **all** questions.

Suggested working time: 90 minutes.

Question 20

(18 marks)

The designer of this skinsuit has used a knit fabric to create a comfortable, functional garment for cyclists. Consider this information and the data in the radar chart below when answering the question parts.



- (a) With reference to the radar chart, identify which fabric would be the most functional and ergonomic for the skinsuit, and justify your selection against the other fabrics available. (5 marks)

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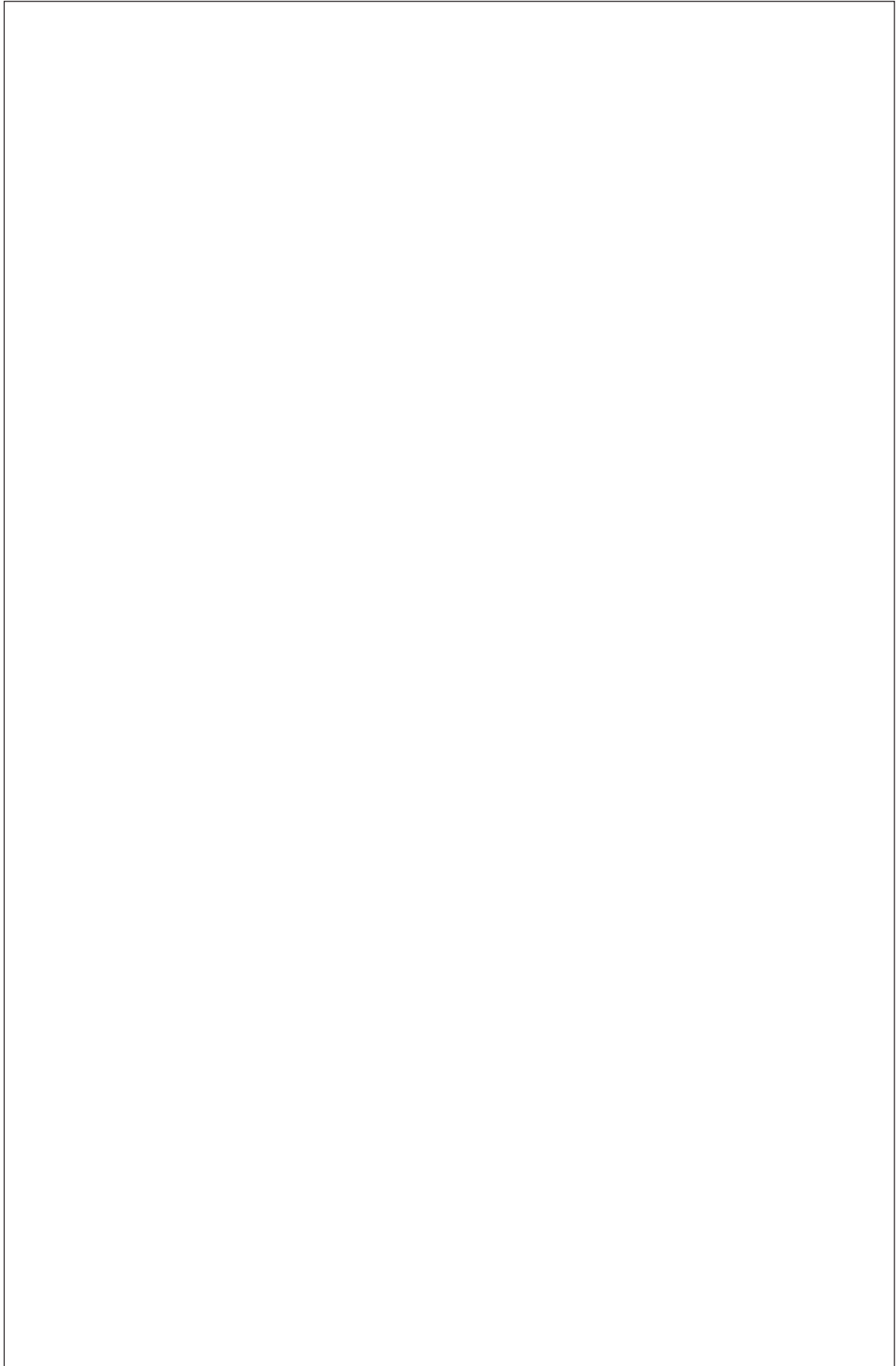
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- (b) Select **one** of the four properties from the radar chart and in the space below sketch and annotate a method for testing that property. (6 marks)



**Question 20** (continued)

- (c) Outline **three** factors you must consider to ensure reliability of test results. (3 marks)

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- (d) With reference to its characteristics, explain what method of joining would be most suitable for the seams of the skinsuit. (4 marks)

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Question 21

(9 marks)

Health and safety is a priority when using the machine pictured.



Sewing machine

- (a) Outline **three** safety checks that should be carried out on the machine before switching it on. (3 marks)

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- (b) A student is using the machine to sew a seam and notices that the fabric is not moving and the machine is stitching repeatedly in the same place. Describe how this problem could be corrected. (2 marks)

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- (c) Outline **four** strategies that a company could implement to establish and maintain a safe work culture. (4 marks)

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Question 22

(16 marks)

- (a) Complete the table for **three** finishes and state how it enhances the appearance of the fabric. (6 marks)

Name of finish	Enhance the appearance of fabric

- (b) Using an example, outline **three** ways in which finishes add value to products. (4 marks)

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- (c) The development of new materials impacts how products can be used by designers and consumers. Explain **two** ways in which new materials generate innovation and create new design possibilities. (6 marks)

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Question 23

(11 marks)

A small-scale manufacturer has purchased new CNC technology for their garment manufacturing workshop.

- (a) Define the term CNC. (2 marks)

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- (b) List **three** advantages and **three** disadvantages to the manufacturer of investing in this new technology. (6 marks)

Advantages	Disadvantages
One: _____ _____ _____ _____	One: _____ _____ _____ _____
Two: _____ _____ _____ _____	Two: _____ _____ _____ _____
Three: _____ _____ _____ _____	Three: _____ _____ _____ _____



- (c) Identify **one** CNC machine used in the clothing manufacturing industry and explain how it works. (3 marks)

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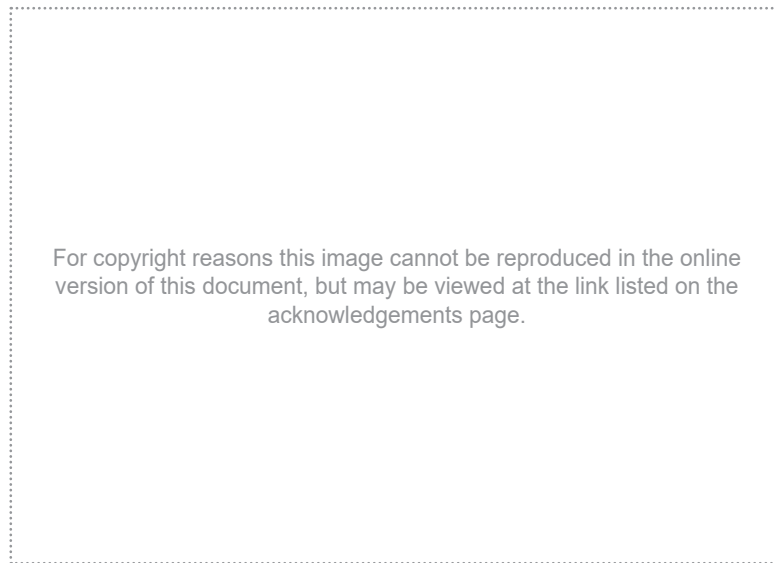
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**Question 24**

**(8 marks)**

The bridal gown shown below is made out of 150 cm wide Duchess silk satin.



- (a) The Duchess silk satin is available from several suppliers. Complete the table below to calculate the cost per metre for each supplier. Round the costs to the nearest cent.

**(2 marks)**

<b>Supplier</b>	<b>Length (metres)</b>	<b>Price per length</b>	<b>Cost per metre (\$)</b>
A	6.1	\$326.04	\$53.45
B	6.1	\$368.20	
C	6.1	\$349.90	

- (b) The fabric will be purchased from Supplier A. Complete the cutting list below and calculate the cost of the materials to manufacture the bridal gown. Round the costs to the nearest cent.

**(3 marks)**

**Material cutting/costing list**

<b>Part Name</b>	<b>Number Required</b>	<b>Length</b>	<b>Cost of part(s)</b>
Skirt front	1	2.2 m	
Skirt back	1	3.15 m	
Bodice	1	0.75 m	

The manufacturer has decided to produce the bridal gown in another size and to add a longer train to the skirt back.

- (c) Complete the adjusted cutting list below and calculate the cost of the materials to manufacture the bridal gown. Round the costs to the nearest cent. (3 marks)

**Material cutting/costing list**

<b>Part Name</b>	<b>Number Required</b>	<b>Length</b>	<b>Cost of part(s)</b>
Skirt front	1	2.5 m	
Skirt back	1	5.15 m	
Bodice	1	0.95 m	

Question 25

(10 marks)

The manufacture of goods has altered significantly and continues to grow and change. Companies design and use new technologies and materials to improve products, reduce costs and increase profits to be competitive. These innovations have changed the way humans are involved in manufacturing processes. In the global era, societal attitudes and standards of human rights and ethical work have changed.

Outline **five** ethical issues Australian manufacturers face and how they manage the ethical production of their goods.

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## ACKNOWLEDGEMENTS

- Question 8** Colwell, D. (n.d.). *Stackable A-chair* [Photograph 3/8]. Retrieved June, 2020, from [https://www.davidcolwell.com/o\\_range\\_Achair\\_gal.html](https://www.davidcolwell.com/o_range_Achair_gal.html)
- Questions 9, 15** Hafco. (n.d.). *PD-440 - pedestal drill - belt drive* [Photograph 1/20]. Retrieved June, 2020, from <https://www.machineryhouse.com.au/d598>
- Question 12** Diamond Creek Furniture Collection. (n.d.). *Quadrat console table* [Photograph]. Retrieved June, 2020, from <https://www.bellarinefurniture.com.au/product-page/quadrat-hall-table>
- Question 14** Joli. (n.d.). *Wire bar stool* [Photograph]. Retrieved June, 2020, from <https://tbcontractfurniture.com/products/wire-bar-chair>
- Question 18** Adapted from: [Photograph of black and glass narrow console table, 6/22]. Retrieved June, 2020, from [https://www.wayfair.com/furniture/pdp/ebern-designs-coppock-console-table-w001219530.html?piid=36049709&utm\\_source=Pinterest&utm\\_medium=Social](https://www.wayfair.com/furniture/pdp/ebern-designs-coppock-console-table-w001219530.html?piid=36049709&utm_source=Pinterest&utm_medium=Social)
- Question 20** FDX Sports. (n.d.). *FDX N0 classic triathlon skin-suit for cycling/swimming/running race* [Photograph 1/9]. Retrieved June, 2020, from <https://www.ebay.com/itm/FDX-Mens-Classic-Cycling-Skinsuit-Stylish-Padded-One-Piece-Cycling-Tri-Suit-Set-/172614279975>
- Question 21** Adapted from: Bernina. (n.d.) [Photograph of Bernina 1008 sewing machine]. Retrieved June, 2020, from <https://www.penelope.ca/us/bernina-couture-1008.html>
- Question 24** Hannah, A. (n.d.). [Photograph of Ellie wedding dress, 2/5]. Retrieved June, 2020, from <https://www.alanhannah.co.uk/dress/ellie/>

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