



ATAR course examination, 2019

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

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: non-programmable calculators approved for use in this 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	27	15
Section Two Extended answer	4	4	40	37	25
Section Three Candidates to choose one of the following contexts: Wood Metal Textiles	6	6	90	69	60
Total					100

Instructions to candidates

- The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2019*. 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% (69 Marks)**

You are required to choose **one** of the following options, according to the context you have studied in 2019.

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

Context	✓	Question	Pages
Wood	<input type="checkbox"/>	8–13	5–14
Metal	<input type="checkbox"/>	14–19	15–24
Textiles	<input type="checkbox"/>	20–25	25–35

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

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Section Three: Wood context

60% (69 Marks)

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

Suggested working time: 90 minutes.

Question 8

(10 marks)

- (a) Identify an innovative timber and list **three** advantages and **three** disadvantages of using this material over solid timber. (7 marks)

Innovative timber: _____

Advantages: _____

Disadvantages: _____

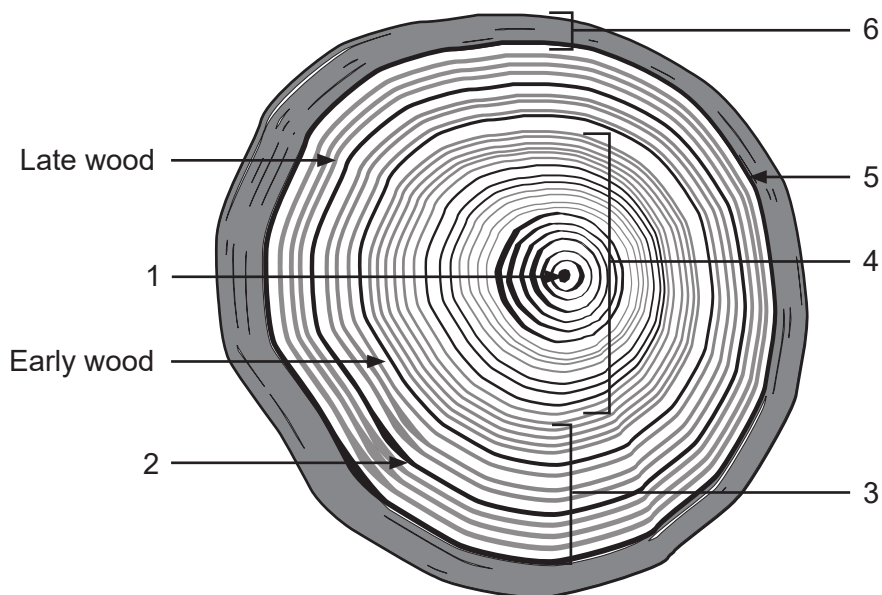
- (b) With reference to the material identified above, explain the influence this material has had in relation to product design. (3 marks)

Question 9

(15 marks)

With reference to the characteristics of hardwoods and softwoods, answer the following questions.

- (a) Using the diagram below, label the parts in the cross-section of the tree. Two have been completed for you. (6 marks)



- (b) Identify **four** differences in cellular structure between softwoods and hardwoods. (4 marks)

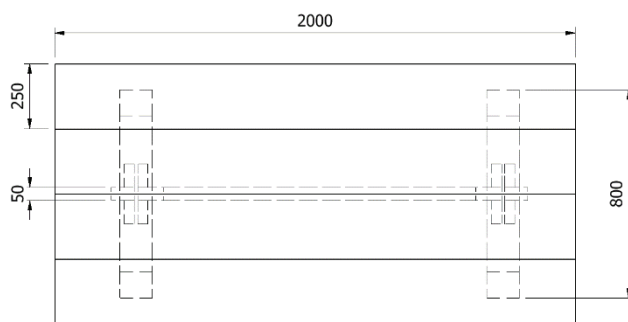
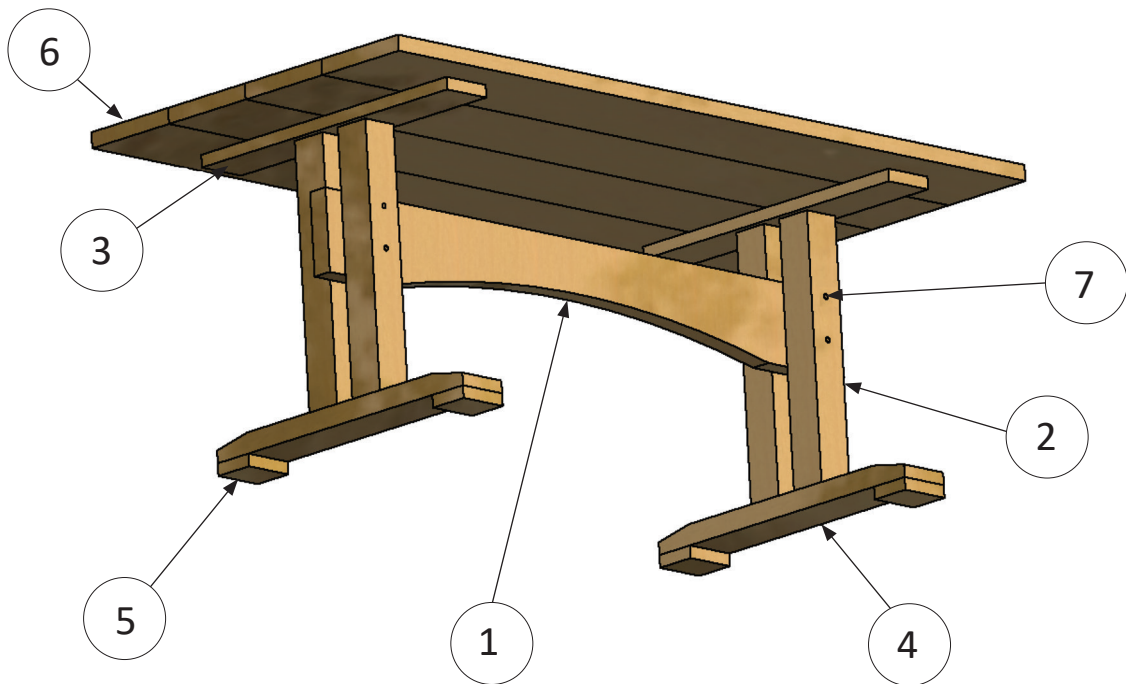
- (c) Describe **one** method of seasoning timber. (2 marks)

- (d) List **three** consequences of using timber that has not been seasoned appropriately to the correct moisture content. (3 marks)

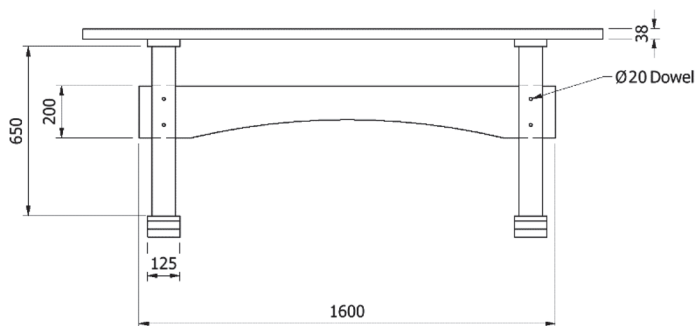
Question 10

(18 marks)

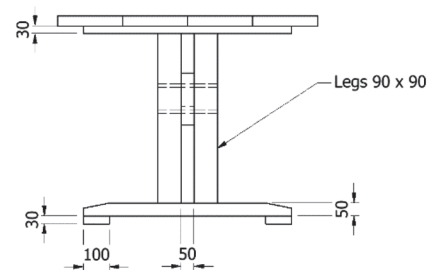
Below is an image and a set of plans for an indoor dining table.



TOP VIEW



FRONT VIEW



SIDE VIEW

See next page



Material (mm)	Price per metre
125 x 30	\$15.72
125 x 38	\$16.55
125 x 50	\$21.34
90 x 90	\$42.90
250 x 38	\$48.88
200 x 50	\$45.75
Dowel 20	\$9.05

- (a) Using the plans on page 8 and the information above, complete the cutting list below and calculate the cost of the materials required to manufacture the dining table. Round the costs to the nearest cent. (7 marks)

Material cutting list

Part name	Material (mm)	Number required	Total length required (m)	Price per metre	Cost of part(s)
1. Stretcher	200 x 50				
2. Leg	90 x 90				
3. Short rail	125 x 30				
4. Leg base	125 x 50				
5. Foot	125 x 30				
6. Top	250 x 38				
7. Dowel	20				

- (b) Other than materials, identify **three** considerations to be taken into account in costing this product for a client. (3 marks)

Question 10 (continued)

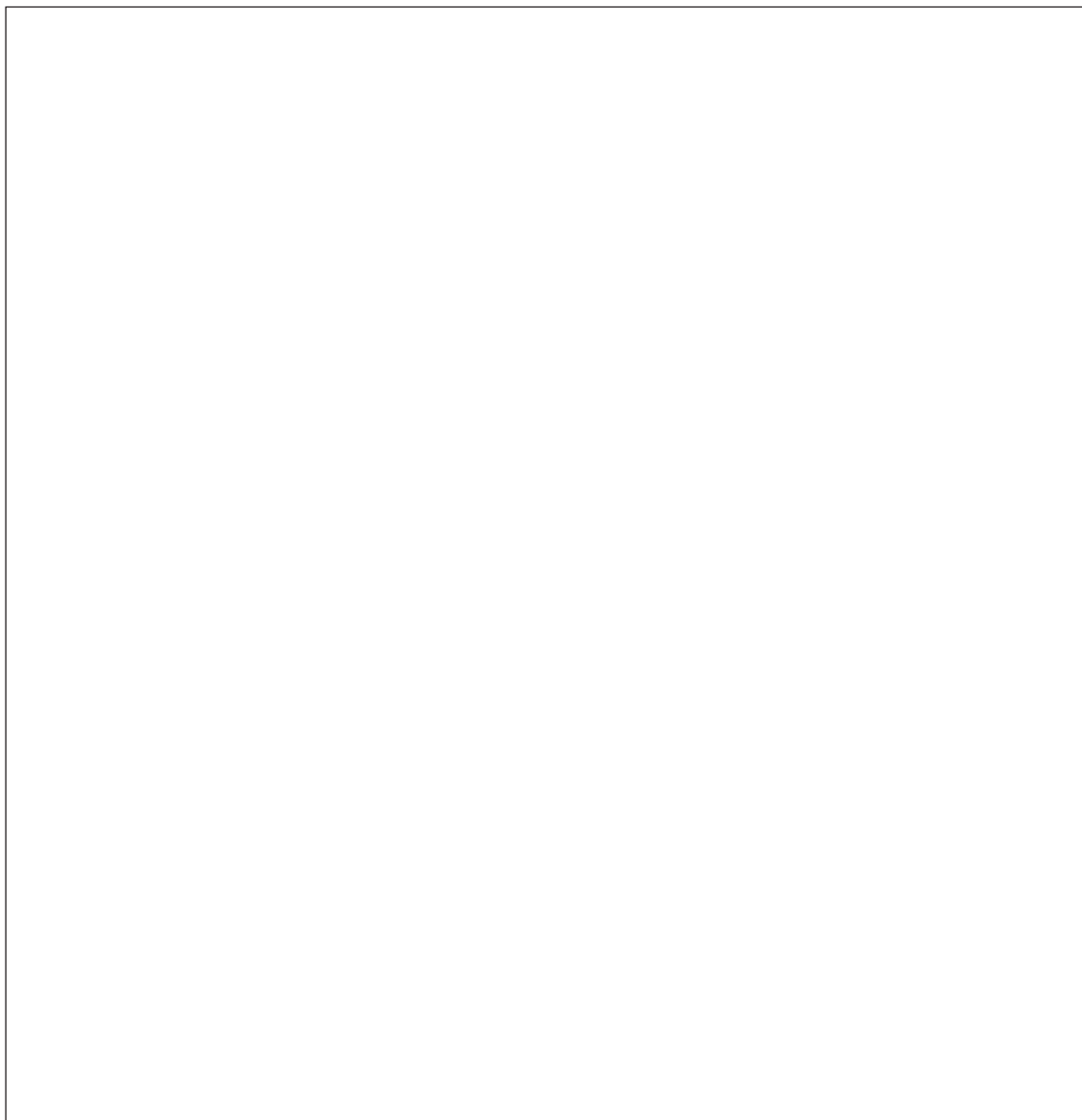
- (c) During the production of the dining table, the manufacturer created a number of jigs and templates to help cut some of the shapes and to drill holes.

Identify **two** advantages that the manufacturer would gain by using the jigs and templates. (2 marks)

One: _____

Two: _____

- (d) In the space below, sketch and annotate a jig or template that could be used to assist in the manufacture of the dining table. (6 marks)



Question 11

(10 marks)

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When routing timber, there are many variables to consider and the ability to identify and solve problems is an important skill. In the table below, identify the causes of the possible problems and state the appropriate solutions.

Problem	Cause of problem	Solution
Burning timber		
Router running along uncontrolled		
Inconsistent cutting depth		
Wood splintering/tearing		
Router will not start		

See next page

Question 12

(6 marks)

In recent years, there has been a movement toward the establishment of small-scale local design and production companies catering for individual needs.

(a) Define the term 'niche market'.

(2 marks)

(b) With reference to the statement above, explore how small-scale local industries have adapted to ensure success in the global market.

(4 marks)

Section Three: Metal context

60% (69 Marks)

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

Suggested working time: 90 minutes.

Question 14

(10 marks)

- (a) Identify a new or emerging metal and list **three** advantages and **three** disadvantages of using this material over traditional materials. (7 marks)

New or emerging metal: _____

Advantages: _____

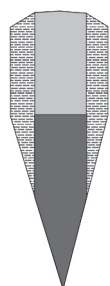
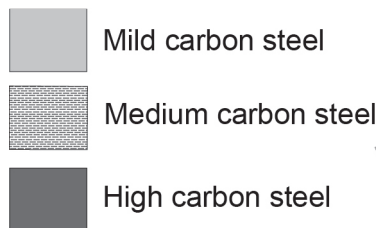
Disadvantages: _____

- (b) With reference to the material identified above, explain the influence this material has had in relation to product design. (3 marks)

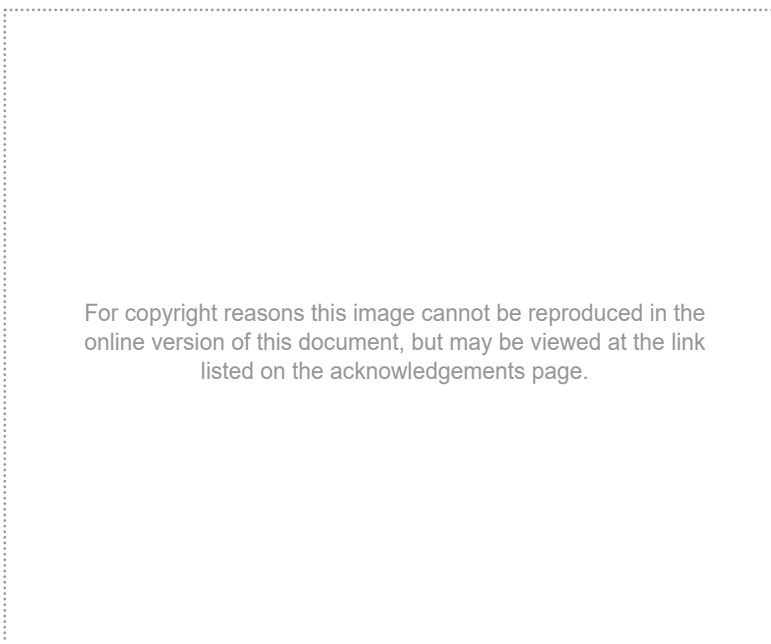
Question 15

(15 marks)

Traditional Japanese bladed swords were made through a labour-intensive forging process. Each blade was made up of layers of carbon steel and then heat-treated prior to use.



Japanese blade cross-section



- (a) On the basis of their properties, provide a reason for the use of each of the **three** different types of steel in the production of the Japanese blade. (3 marks)

- (b) The tsuba (hand guard) is made from a non-ferrous alloy. Identify a possible metal from which it could be made. (1 mark)

- (c) Identify **three** advantages of using an alloy. (3 marks)

(d) Identify **four** differences between the characteristics of ferrous and non-ferrous metals. (4 marks)

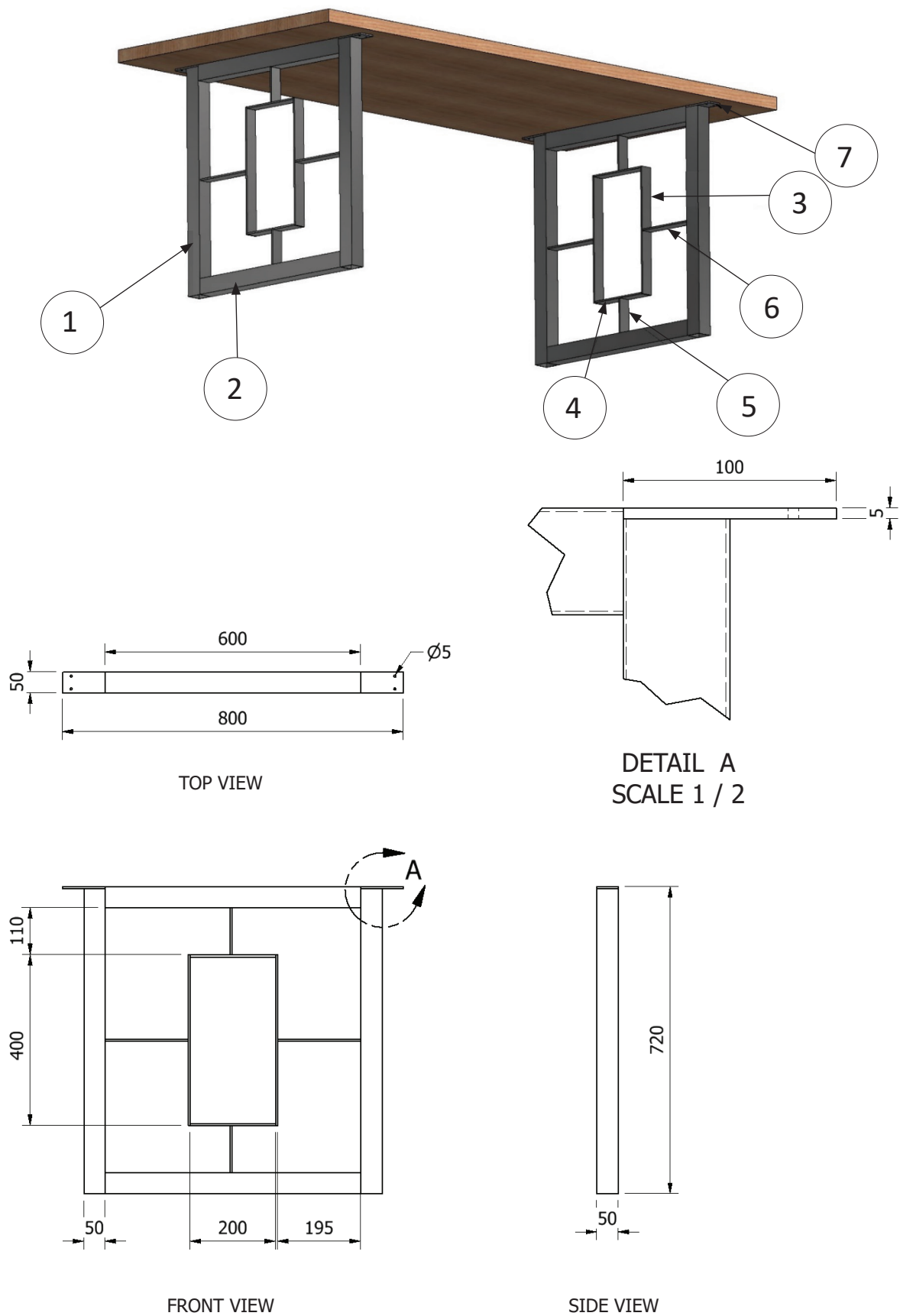
(e) The blade was heat-treated to change the properties of the steel. For **two** of the heat treatment methods listed below, state the property change that is involved and how each process could be achieved in the school workshop. Use correct workshop terminology. (4 marks)

- Hardening
- Tempering
- Annealing
- Normalising

Question 16

(18 marks)

Below is an image and a set of plans for an indoor dining table.



See next page



Material (mm)	Price per metre
50 x 50 x 1.6 ERW tubing – square	\$10.85
40 x 5 mild steel flatbar	\$4.67
50 x 5 mild steel flatbar	\$5.83

- (a) Using the plans on page 18 and the information above, complete the cutting list below and calculate the cost of the materials required to manufacture the dining table (wood top not included). Round the costs to the nearest cent. (7 marks)

Material cutting list

Part name	Material (mm)	Number required	Total length required (m)	Price per metre	Cost of part(s)
1. Leg upright	50 x 50 ERW tubing				
2. Leg rail	50 x 50 ERW tubing				
3. Rectangle vertical	40 x 5 mild steel flatbar				
4. Rectangle horizontal	40 x 5 mild steel flatbar				
5. Spacer vertical	40 x 5 mild steel flatbar				
6. Spacer horizontal	40 x 5 mild steel flatbar				
7. Mounting tab	50 x 5 mild steel flatbar				

- (b) Other than materials, identify **three** considerations to be taken into account in costing this product for a client. (3 marks)

Question 16 (continued)

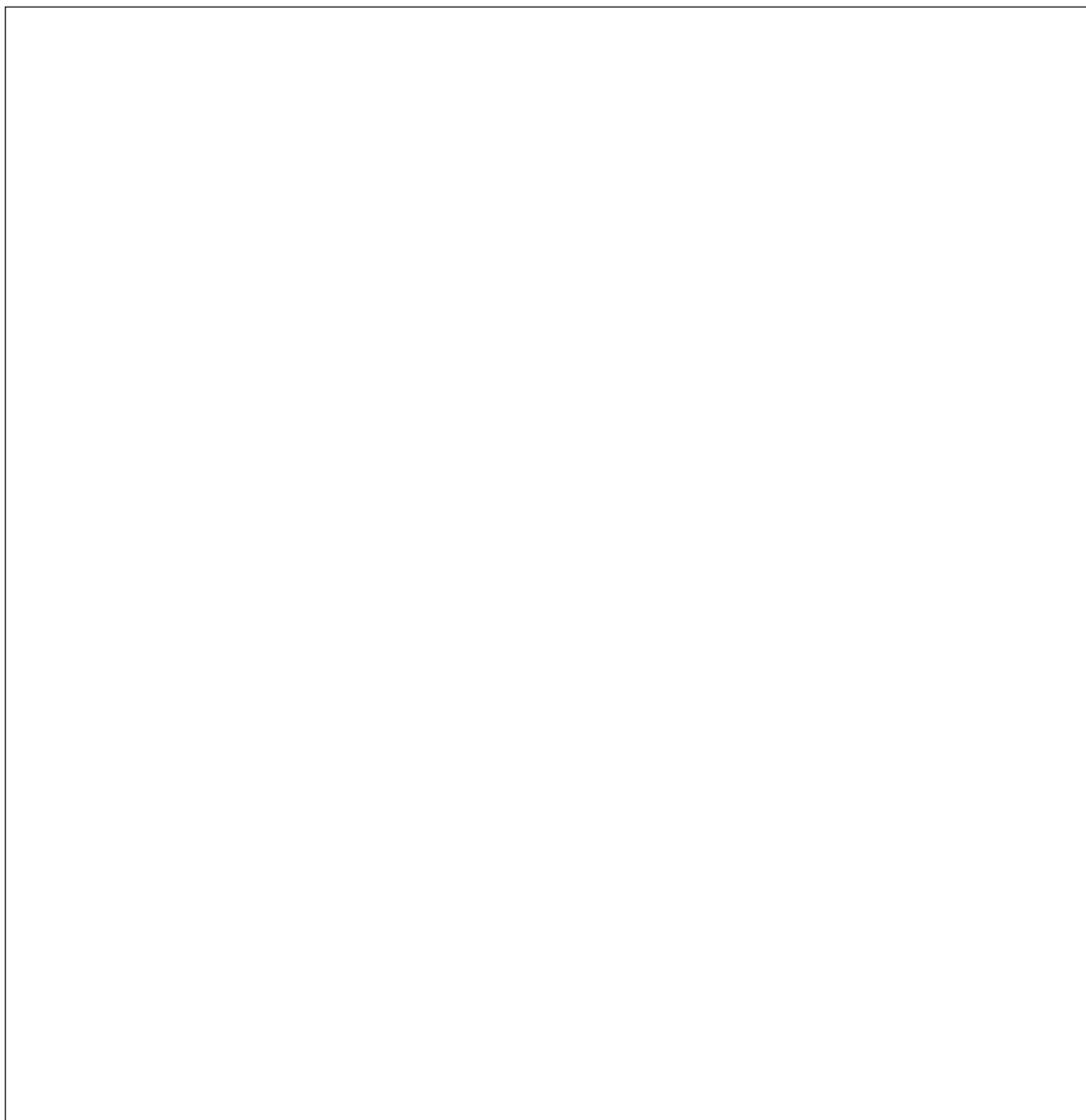
- (c) During the production of the dining table, the manufacturer created a number of jigs and templates to help align the parts prior to welding.

Identify **two** advantages that the manufacturer would gain by using the jigs and templates. (2 marks)

One: _____

Two: _____

- (d) In the space below, sketch and annotate a jig or template that could be used to assist in the manufacture of the dining table. (6 marks)



Question 17

(10 marks)

Metal Inert Gas (MIG) welding is a welding process that joins metal together.

MIG welder

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Quality MIG welds are the result of not only good welding technique but also the ability to identify and solve problems if they occur. In the table below, identify the causes of the possible problems and state the appropriate solutions.

Problem	Cause of problem	Solution
No electrical arc (spark) during welding operation		
Porosity of weld (small pinholes)		
Workpiece is distorting (warping) after welding		
Lack of penetration – shallow fusion between weld metal and workpiece		
Electrode (wire) is not coming out of handpiece		

See next page

Question 18

(6 marks)

In recent years, there has been a movement toward the establishment of small-scale local design and production companies catering for individual needs.

(a) Define the term 'niche market'.

(2 marks)

(b) With reference to the statement above, explore how small-scale local industries have adapted to ensure success in the global market.

(4 marks)

Section Three: Textiles context

60% (69 Marks)

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

Suggested working time: 90 minutes.

Question 20

(10 marks)

- (a) Identify a knit fabric and list **three** advantages and **three** disadvantages of using this material over a woven fabric. (7 marks)

Knit fabric: _____

Advantages: _____

Disadvantages: _____

- (b) With reference to the knit fabric identified above, explain the influence this material has had in relation to product design. (3 marks)

Question 21

(15 marks)

- (a) Referring to a fibre, describe how its longitudinal shape affects its properties. (2 marks)

- (b) List **three** predominantly crystalline fibres. (3 marks)

- (c) With reference to their properties, distinguish the differences between the polymer structures of amorphous and crystalline fibres. (4 marks)

(d) Identify **three** advantages of using a fibre blend. (3 marks)

(e) Select a type of yarn and outline why a designer would choose that yarn. (3 marks)

Question 22

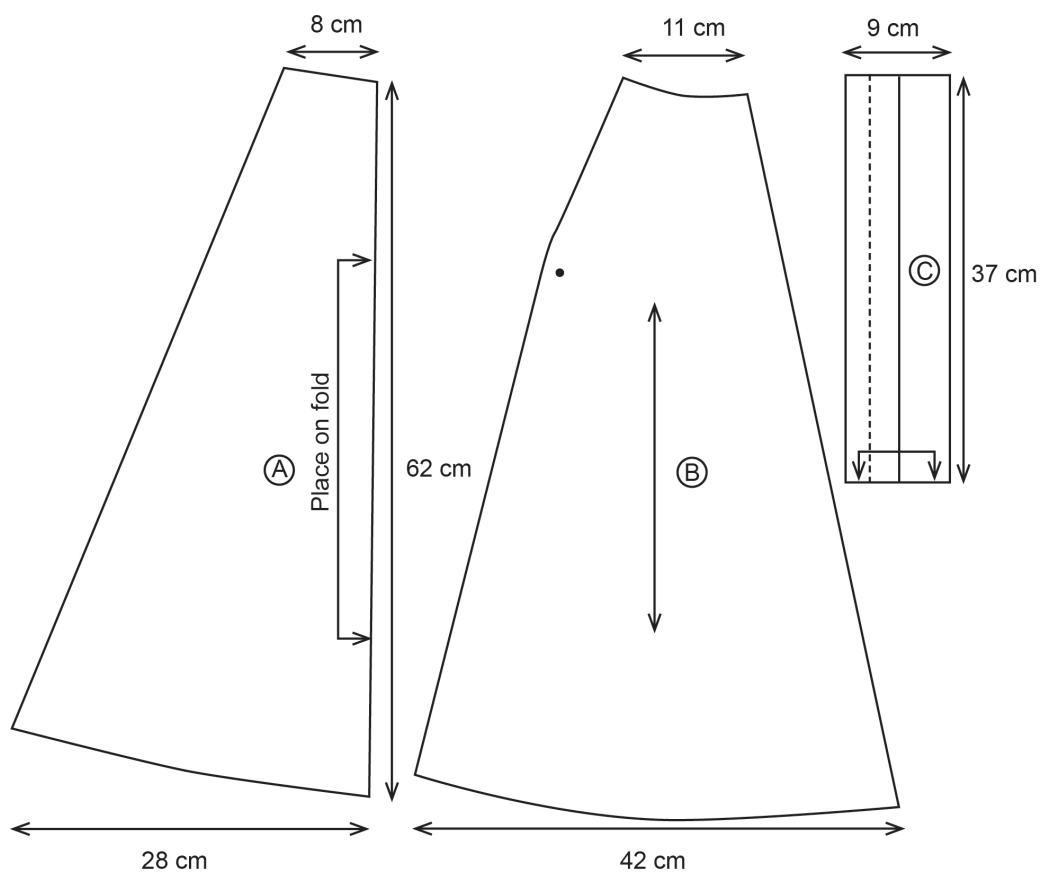
(18 marks)

Below are images and pattern pieces for a size 8 skirt. This skirt is lined with acetate fabric and has a side zipper with top hook and eye. Its waistband is interfaced and folded for strength and decorated with a lace trim.



FRONT

BACK



See next page

Materials	Price per metre
Cotton plain weave 150 cm wide	\$4.95/m
Patterned cotton sateen weave 150 cm wide	\$14.95/m
Interfacing – medium weight woven 112 cm wide	\$9.99/m
Acetate lining 115 cm	\$4.99/m
Lace trim	\$7.50/m

Materials	Cost
Zipper	\$1.99
Hook and eye packet size 1	\$3.50

Cutting Instructions		
Piece A	Piece B	Piece C
FRONT AND BACK CUT 2 ON FOLD CUT 2 ON FOLD LINING	SIDE CUT 4 CUT 4 LINING	WAISTBAND CUT 1 ON FOLD CUT 1 ON FOLD INTERFACING

- (a) Using the pattern on page 28 and the information above, complete the materials list below and calculate the cost of the materials required to produce the skirt. Round the costs to the nearest cent. (7 marks)

Item	Quantity	Price per metre	Cost
Cotton plain weave			
Cotton sateen weave			
Interfacing			
Lining			
Zipper			
Hooks and eyes			
Lace trim			

Question 22 (continued)

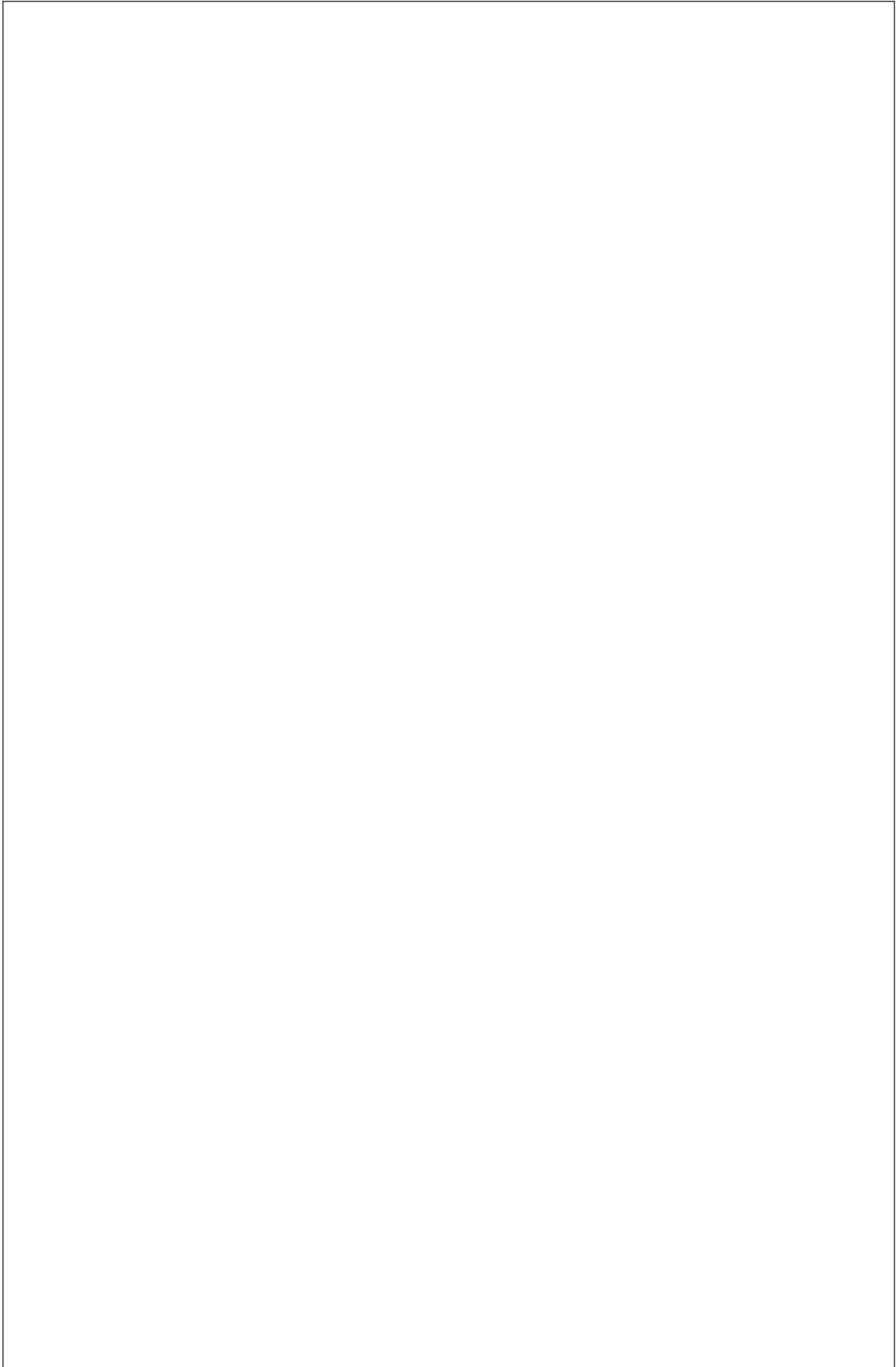
- (b) Other than materials, identify **three** considerations to be taken into account in costing this product for a client. (3 marks)

- (c) Identify **two** processes or items of equipment that a manufacturer could use to improve accuracy when marking or cutting out a pattern. (2 marks)

One: _____

Two: _____

- (d) In the space below, sketch and annotate a pattern layout the manufacturer could use to minimise waste when cutting out the lining pattern pieces A and B. (6 marks)

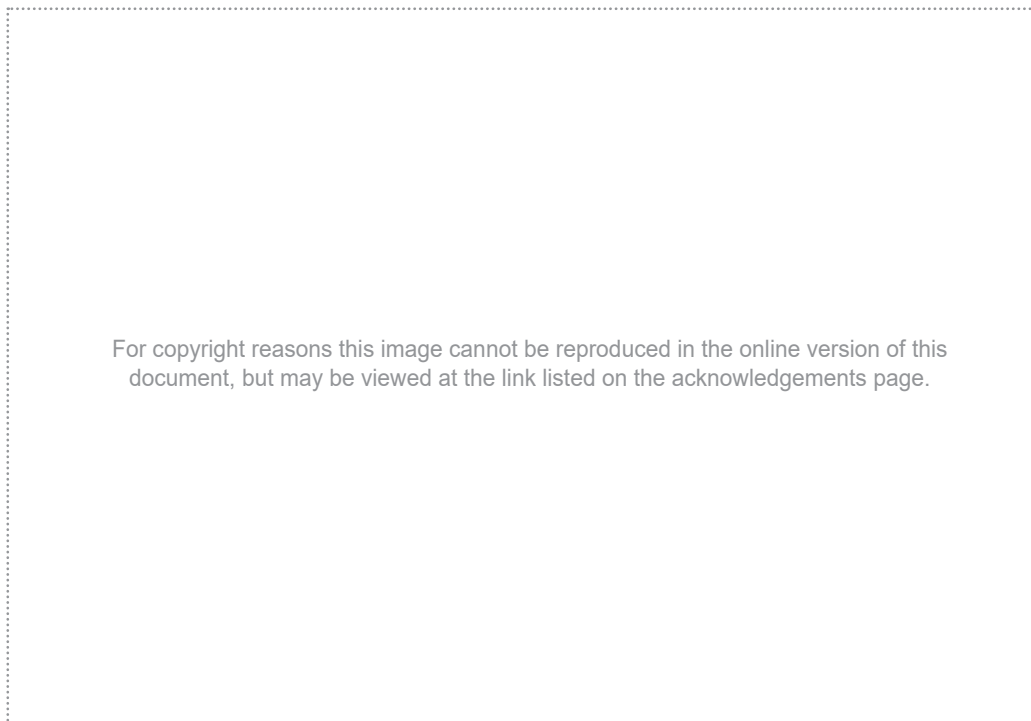


See next page

Question 23

(10 marks)

An overlocker is a piece of equipment that can be used in a variety of ways throughout the production of a textiles item.



Quality overlocking is the result of not only good technique, but also the ability to identify and solve problems if they occur. In the table below, identify the causes of the possible problems and state the appropriate solutions.

Problem	Cause of problem	Solution
Fabric rolling under		
Loose looper threads		
Thread not on the edge of the material		
Stitching gathering		
Fabric cutting caught in stitching		

See next page

Question 24

(6 marks)

In recent years, there has been a movement toward the establishment of small-scale local design and production companies catering for individual needs.

(a) Define the term 'niche market'.

(2 marks)

(b) With reference to the statement above, explore how small-scale local industries have adapted to ensure success in the global market.

(4 marks)

ACKNOWLEDGEMENTS

- Question 9** Diagram adapted from: Purdue University. (n.d.). *Tree cross section*. Retrieved May, 2019, from https://extension.entm.purdue.edu/EAB/images/tree_cross_section_lg.gif
- Question 11** Image adapted from: Makita. (n.d.). *3-1/4 HP* Plunge Router, with Variable Speed*. Retrieved May, 2019, from <https://www.makitatools.com/products/details/RP2301FC>
- Question 15** Left image adapted from: Ghiraddje. (2016). Katana brique [Diagram]. In *Wikipedia*. Retrieved May, 2019, from https://en.wikipedia.org/wiki/File:Katana_brique.svg#mw-jump-to-license
Used under Creative Commons CC0 1.0 Universal Public Domain Dedication
Right image adapted from: [Japanese sword and blade cross-section diagram]. (n.d.). Retrieved May, 2019, from <https://www.historynet.com/daisho-mystical-blades-of-the-japanese-samurai.htm>
- Question 17** Diagram adapted from: Ward, J. (2017). *How to set up to MIG weld*. Retrieved May, 2019, from <http://www.kingsofwelding.com/guides/mig-welding-guide/>
Second paragraph (first sentence) adapted from: Bernard. (n.d.). *The basics: MIG troubleshooting*. Retrieved May, 2019, from <https://www.bernardwelds.com/the-basics-mig--p152389#Top>
- Question 19** First paragraph adapted from: Government of Western Australia, Department of Jobs, Tourism, Science and Innovation. (2018, September). *Western Australia iron ore profile*. Retrieved May, 2019, from https://www.jtsi.wa.gov.au/docs/default-source/default-document-library/wa-iron-ore-profile---september-20188cfa10a57ba2628e86e4ff0000981137.pdf?sfvrsn=5a0d721c_6
- Question 22** Floral pattern on skirt adapted from: DrCarl. (2014). [Rose wallpaper image]. Retrieved May, 2019, from <https://pixabay.com/sv/photos/rose-rosor-blommor-red-valentine-374318/>
- Question 23** Image adapted from: BERNINA. (n.d.). *Overlock 1150 MDA* [Diagram]. Retrieved May, 2019, from <https://www.bernina.com/en-GB/Local-Resources-gb/UK/school-downloads/Overlock-1150MDA.pdf>

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