Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel Level 3 GCE

Centre Number | | | | | |

Candidate Number | | | | |

Friday 14 June 2019

Morning (Time: 2 hours 30 minutes) | Paper Reference **9DT0/01**

Design and Technology (Product Design)

Advanced
Component 1

You must have:
a calculator and a ruler.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- For questions requiring mathematics, you must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 5 9 7 7 7 A 0 1 2 8

Pearson

Answer ALL questions. Write your answers in the spaces provided.

1 Figure 1 shows a cycling helmet with an outer shell manufactured from carbon fibre.

Figure 1

Cycling helmets often require graphics to be applied to their outer surface to produce an aesthetically pleasing outcome. The helmet graphics can be produced using a CNC vinyl cutter.

(a) Give **two** checks on the vinyl that need to be made before starting the cutting process.

(2)

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(b) Explain **two** properties of carbon fibre that make it a suitable material for the outer shell of the cycle helmet.

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(c) Explain **one** advantage of using carbon fibre rather than polyvinyl chloride (PVC) for the outer shell of the cycle helmet.

(3)

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(Total for Question 1 = 9 marks)

2 Figure 2 shows a roof truss manufactured from redwood. The roof truss is designed to support the weight of the roof tiles and any additional loads.

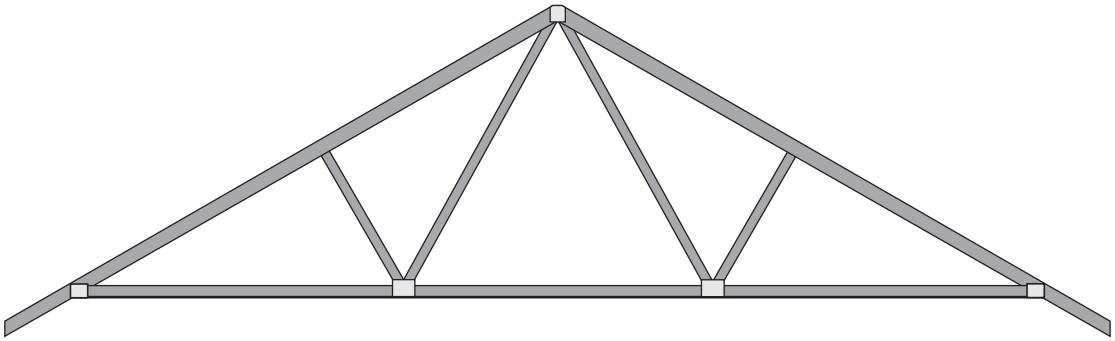

Figure 2

(a) State **two** properties of redwood that make it suitable for the roof truss.

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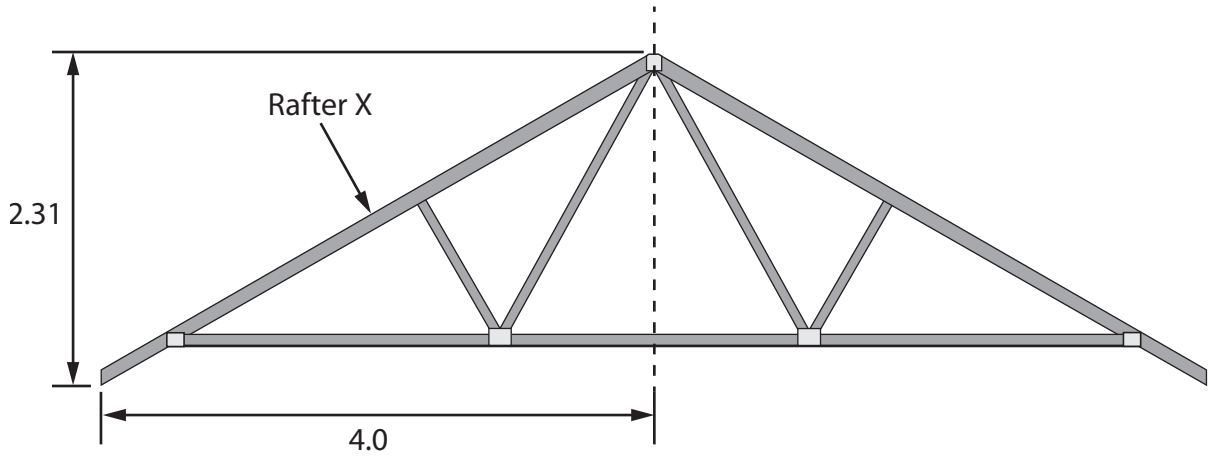
(b) Figure 3 shows some of the dimensions of the roof truss.



All dimensions are shown in metres

Figure 3

In order to check that you have the correct lengths of timber in stock you need to check the length of the rafters.

Calculate the length of rafter X.

Give your answer to two decimal places.

Show all of your workings.

(5)

Answer ..... m

(Total for Question 2 = 7 marks)

3 The packaging of commercial products often uses boards with graphics applied to the surface.

(a) Explain **one** property of folding box board that makes it a suitable material for the packaging of commercial products.

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(b) Describe, using annotated sketches, the process of printing using flexography.

(4)

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(c) Explain **two** advantages of using flexography rather than gravure for printing on commercial packaging.

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(Total for Question 3 = 12 marks)

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4 Figure 4 shows a bespoke rocking chair with laminated hardwood rockers.

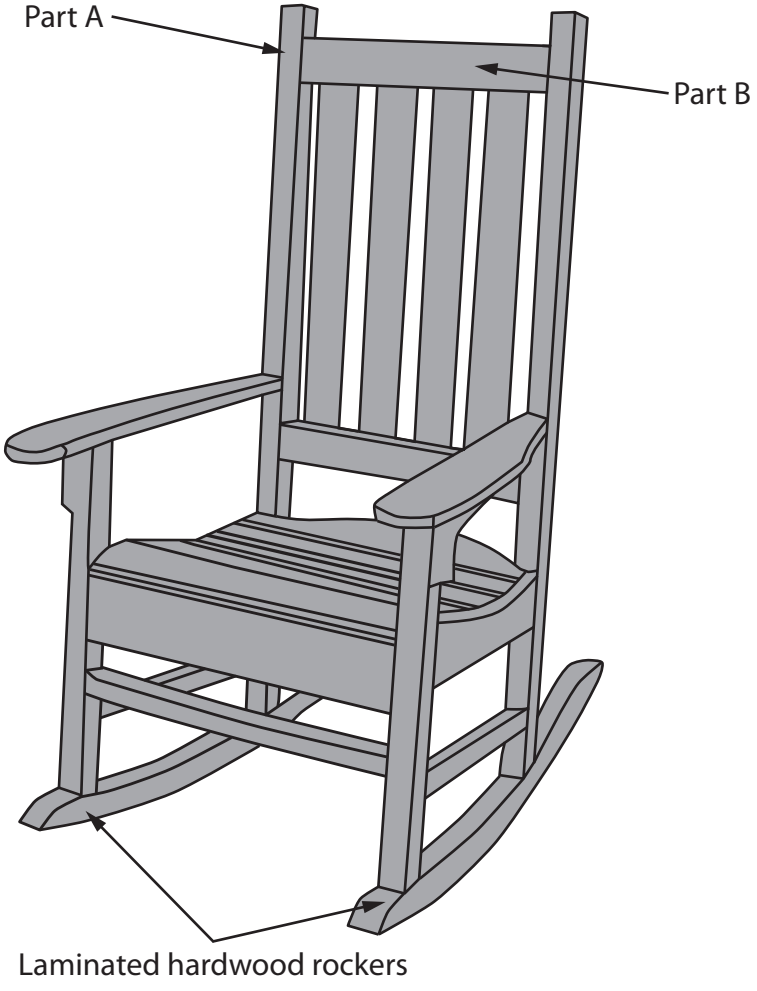

Figure 4

(a) Name **three** joints that could be used to join part A to part B.

(3)

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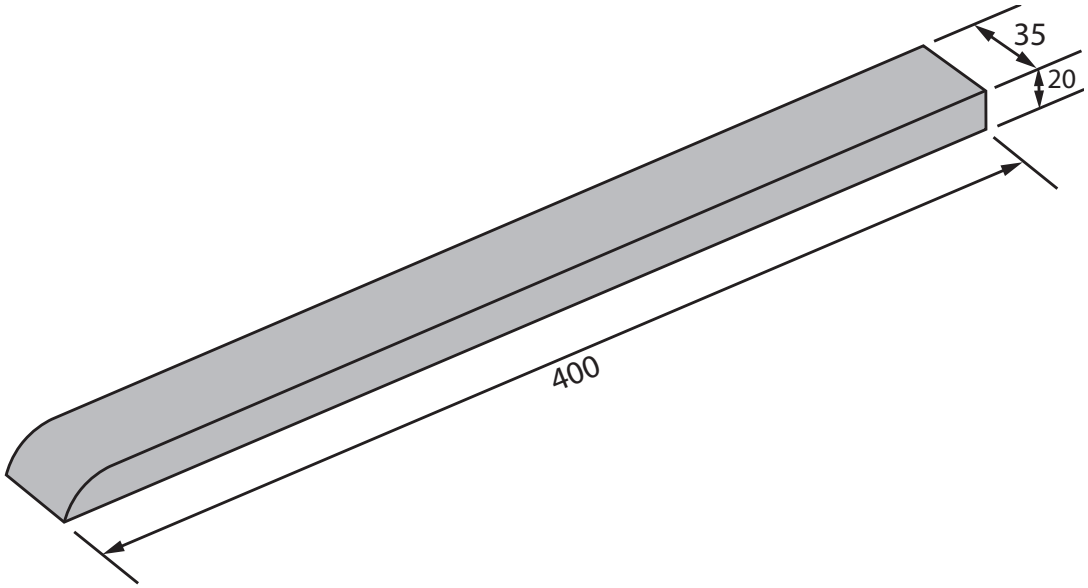
The hardwood rockers have been laminated to produce their curved shape.

(b) Outline the process used for laminating the hardwood rockers.

(6)

Figure 5 shows one of the pieces of hardwood used to make the base of the seat.

The cutting list shows the total number of pieces required for a batch of chairs.



Each piece has a 20mm radius on one end
All dimensions are shown in millimeters

Figure 5

Cutting List				
Description	**Length**	**Width**	**Thickness**	**Quantity**
Seat base	400	35	20	2400

(c) Calculate the volume of varnish required, in litres, to coat the hardwood pieces.

1 litre of varnish covers 11m^2.

- Area of a circle = πr^2
- Circumference of a circle = $2\pi r$
- Use $\pi = 3.142$

Show all of your workings.

(8)

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Answer .....

The company that manufactures the chair has produced images of it for use on their website.

Copyright protection will prevent others from illegally copying the images.

(d) Give **two** other ways a copyright will protect the company's images.

(2)

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(e) Figure 6 shows a graphical representation of the circular economy.

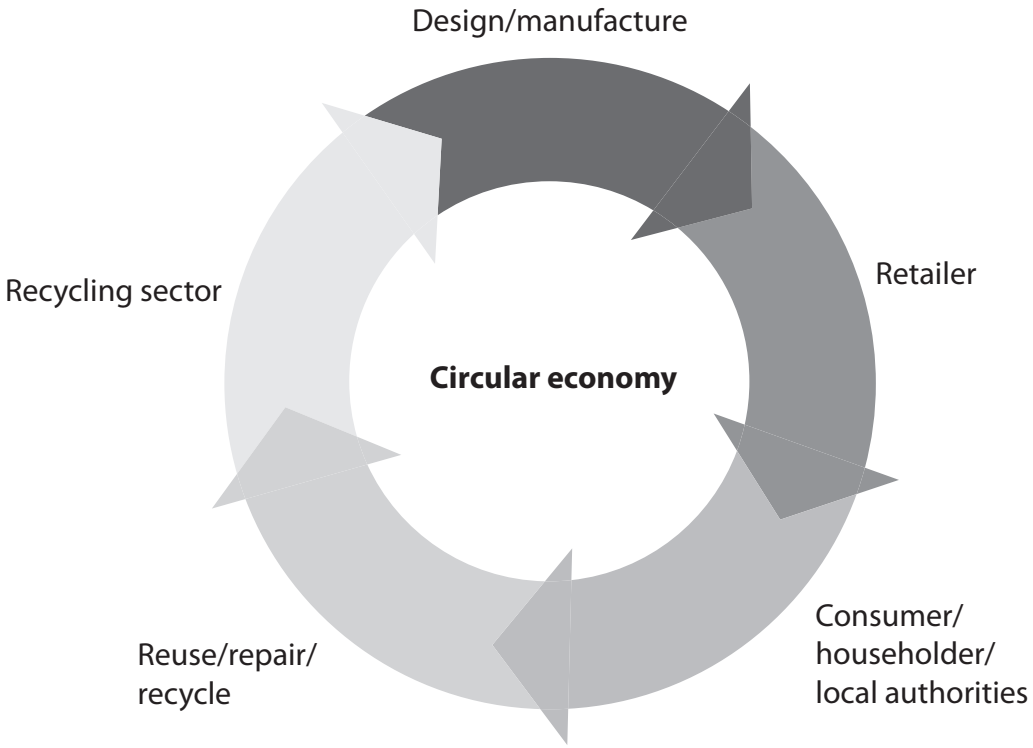

Figure 6

The company is keen to embrace the concept of the circular economy.

Evaluate the use of the circular economy with reference to suppliers and consumers.

(9)

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(Total for Question 4 = 28 marks)

5 Figure 7 shows a games controller.

Anthropometric data has been used in designing the games controller.

Figure 7

(a) Name **two** official sources of comprehensive anthropometric data.

(2)

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The manufacturer has decided to use acrylonitrile butadiene styrene (ABS) for the main body of the games controller.

(b) Explain **two** performance characteristics of ABS that make it a suitable material for the main body of the games controller.

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(c) Designers have to prioritise form or function when designing products.

Discuss how the designer has balanced form and function in the design of the games controller.

(6)

(d) Automated materials handling systems are to be used in the factory producing the games controller.

Name **two** types of automated materials handling systems.

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(e) The games controllers need to be packaged for sale.

The board used for packaging the games controllers costs £36.88 per pack.

Each pack contains 50 A2 sheets (420mm x 594mm).

A total of 310m^2 of board will need to be ordered for the packaging of the games controllers.

The board can only be ordered in whole packs.

Calculate the total cost of the order.

Show all of your workings.

(3)

Answer .....

(f) Figure 8 shows the net (development) for the games controller packaging.

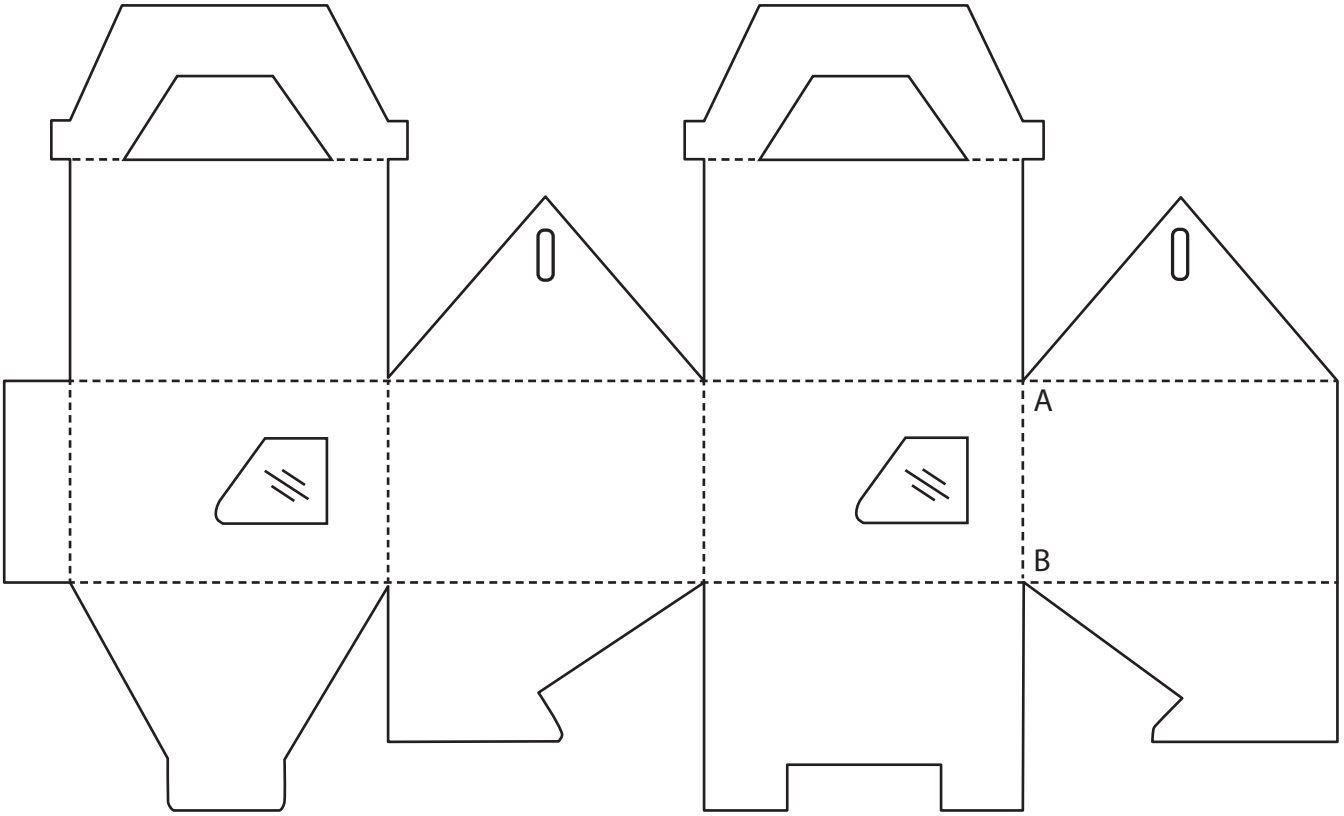


Figure 8

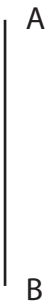
Construct a 2-point perspective drawing of the assembled packaging.

The two vanishing points and line A-B have been provided for you on the opposite page.

(6)

Vanishing Point 1 x

Vanishing Point 2 x



(Total for Question 5 = 25 marks)

6 Figure 9 shows an entrance to a Paris Métro station designed and constructed during the Art Nouveau period.

(Source: © atm2003/Shutterstock)

Figure 9

Discuss how the design of the Métro station entrance was influenced by Art Nouveau philosophies.

(9)

(Total for Question 6 = 9 marks)

7 Figure 10 shows an electric car.

(Source: © Gyuszko-Photo/Shutterstock)

Figure 10

The manufacturer of the electric car is considering two options for the location of a new manufacturing facility:

- a manufacturing facility in the United Kingdom
- a manufacturing facility in a developing country.

The facility will contain the latest and most advanced manufacturing technologies.

(a) Discuss the factors that need to be considered when deciding between the two options for the location of the new manufacturing facility.

(9)

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(b) The new manufacturing facility will make extensive use of computers to control robotic systems during the manufacture of the electric car.

Explain **three** ways that computers have enabled robotic systems to become more effective in the manufacture of the electric car and other consumer products.

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(Total for Question 7 = 18 marks)

8 Figure 11 shows the interior of the electric car.

(Source: © Sergey Kohl/Shutterstock)

Figure 11

The interior has been designed with ergonomics as a key priority.

Evaluate the ergonomics of the interior with reference to aesthetics and user needs.

(12)

(Total for Question 8 = 12 marks)

TOTAL FOR PAPER = 120 MARKS

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