

**Please check the examination details below before entering your candidate information.**

<b>Candidate surname</b>
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<b>Other names</b>
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<b>Centre Number</b>					
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<b>Candidate Number</b>				
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**Pearson Edexcel**

**Level 3 GCE**

**Friday 14 June 2019**

**Morning (Time: 2 hours 30 minutes plus your additional time allowance)**

**Paper Reference 9DT0/01**

**Design and Technology  
(Product Design)**

**Advanced**

**Component 1**

<b>YOU MUST HAVE:</b> a calculator and a ruler a diagram booklet	<b>Total Marks</b>
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## **INSTRUCTIONS**

- **Use BLACK ink, ball-point pen or your usual method.**
- **FILL IN THE BOXES** at the top of the previous 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.**

**ANSWER ALL QUESTIONS.**

**WRITE YOUR ANSWERS IN THE SPACES PROVIDED.**

- 1 Figure 1 in the diagram booklet shows a cycling helmet with an outer shell manufactured from carbon fibre.**

**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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**2. \_\_\_\_\_**

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**1 (b) Explain TWO properties of carbon fibre that make it a suitable material for the outer shell of the cycle helmet. (4)**

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**2.** \_\_\_\_\_

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- 1 (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 in the diagram booklet shows a roof truss manufactured from redwood. The roof truss is designed to support the weight of the roof tiles and any additional loads.**

**(a) State TWO properties of redwood that make it suitable for the roof truss. (2)**

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**2. \_\_\_\_\_**

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- 2 (b) Figure 3 in the diagram booklet shows some of the dimensions of the roof truss.**

**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. (5)**

**Show all of your workings.**

**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. (2)**

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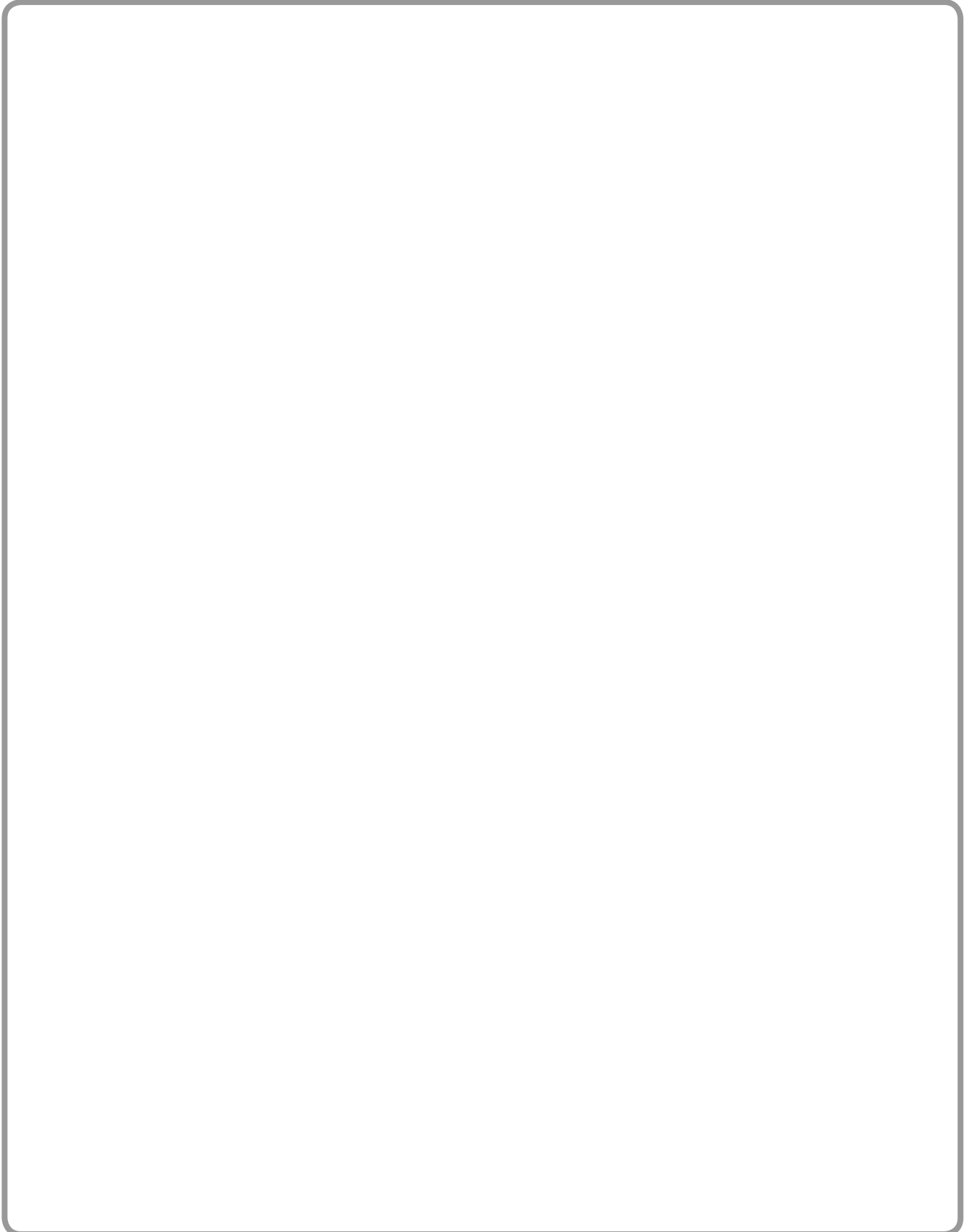
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- 3 (b) Describe, using annotated sketches, the process of printing using flexography. (4)**



**3 (c) Explain TWO advantages of using flexography rather than gravure for printing on commercial packaging. (6)**

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**2.** \_\_\_\_\_

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**(TOTAL FOR QUESTION 3 = 12 MARKS)**

**4 Figure 4 in the diagram booklet shows a bespoke rocking chair with laminated hardwood rockers.**

**(a) Name THREE joints that could be used to join part A to part B. (3)**

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**2.** \_\_\_\_\_

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**3.** \_\_\_\_\_

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

**4 (b) Outline the process used for laminating the hardwood rockers. (6)**

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Figure 5 in the diagram booklet 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.

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

1 litre of varnish covers  $11\text{m}^2$ .

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

Show all of your workings. (8)





**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.**

**4 (d) Give TWO other ways a copyright will protect the company's images. (2)**

**1. \_\_\_\_\_**

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**2. \_\_\_\_\_**

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**4 (e) Figure 6 in the diagram booklet shows a graphical representation of the circular economy.**

**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 in the diagram booklet shows a games controller.**

**Anthropometric data has been used in designing the games controller.**

- (a) Name TWO official sources of comprehensive anthropometric data. (2)**

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**2. \_\_\_\_\_**

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

- 5 (b) Explain TWO performance characteristics of ABS that make it a suitable material for the main body of the games controller. (6)

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**5 (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)**

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

Name TWO types of automated materials handling systems. (2)

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2. \_\_\_\_\_

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- 5 (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  $310\text{m}^2$  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. (3)**

**Show all of your workings.**

**Answer** \_\_\_\_\_

- 5 (f) Figure 8 in the diagram booklet shows the net (development) for the games controller packaging.**

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

**The two vanishing points and line A-B have been provided for you in the diagram booklet.**  
**(6)**

**(TOTAL FOR QUESTION 5 = 25 MARKS)**

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

**Discuss how the design of the Métro station entrance was influenced by Art Nouveau philosophies. (9)**

[illegible]



**(TOTAL FOR QUESTION 6 = 9 MARKS)**

- 7 Figure 10 in the diagram booklet shows an electric car.

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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- 7 (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. (9)

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**(TOTAL FOR QUESTION 7 = 18 MARKS)**

**8 Figure 11 in the diagram booklet shows the interior of the electric car.**

**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)**

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**TOTAL FOR QUESTION 8 = 12 MARKS)**

**TOTAL FOR PAPER = 120 MARKS**