

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

Candidate surname					
Other names					
Centre Number					
Candidate Number					

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

YOU MUST HAVE: a calculator and a ruler a diagram booklet	Total Marks
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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.

continued on the following page

1 (a) Give TWO checks on the vinyl that need to be made before starting the cutting process. (2)

1. _____

2. _____

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

1. _____

continued on the following page

2.

1 (c) Explain ONE advantage of using carbon fibre rather than polyvinyl chloride (PVC) for the outer shell of the cycle helmet. (3)

(TOTAL FOR QUESTION 1 = 9 MARKS)

2 Figure 2 in the diagram booklet shows a roof truss manufactured from red wood. 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)

1.

2.

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 on the following page.

11

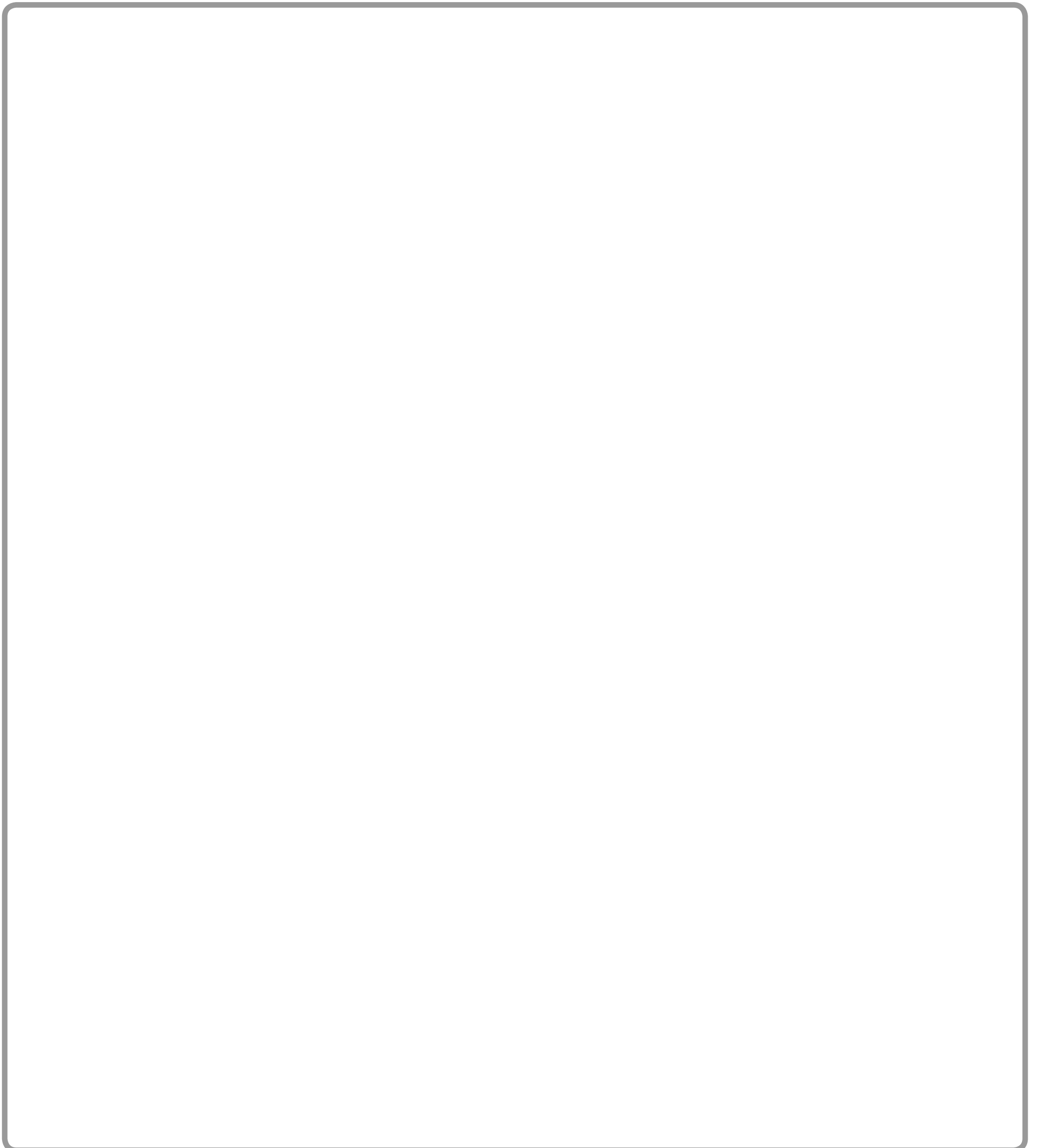
Answer _____ **m**

(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)

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

A large, empty rectangular box with a thin gray border, occupying the lower two-thirds of the page. It is intended for the student to draw annotated sketches of the flexography printing process.

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

1. _____

continued on the following page

15

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)

1. _____

2. _____

continued on the following page

3.

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

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

(6)

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 11m^2 .

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

Show all of your workings on the following page. (8)

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.

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

1. _____

2. _____

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)

1. _____

2. _____

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)

1.

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2. _____

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)

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)

1. _____

2. _____

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 310m² 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 on the following page. (3)

Answer _____

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

Construct 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.

(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)

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(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.

continued on the following page

7 (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)

continued on the following page

1.

continued on the following page

2.

continued on the following page

3.

(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