

Design and Technology  
(Product Design)  
Advanced  
COMPONENT 1

Total Marks
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Wednesday 7th June – Afternoon

Time: 2 hours 30 minutes

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

**YOU MUST HAVE**

**a calculator and a ruler**

**YOU WILL BE GIVEN**

**Diagram Booklet**

**INSTRUCTIONS**

**Answer ALL questions.**

**Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – 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.**

**Turn over**

## **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.**

**There may be spare copies of some diagrams.**

## **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.**

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

**1 Look at Figure 1 for Question 1 in the Diagram Booklet. It shows a wardrobe that is supplied in flat-pack form for self-assembly at home.**

**(a) Knock-down fittings will be used during the home assembly of the flat-pack wardrobe.**

**Name TWO knock-down fittings that could be used for assembling the flat-pack wardrobe.  
(2 marks)**

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

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

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**1 continued.**

**(b) The wardrobe is made from chipboard. A thin veneer of hardwood has been applied to the surface of the chipboard.**

**Explain TWO characteristics of veneered chipboard that make it a suitable material for flat pack wardrobes.  
(4 marks)**

**Answer space continues on the next page.**

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**Turn over**

**1(b) continued.**

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

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**(continued on the next page)**

**1 continued.**

**(c) Explain one DISADVANTAGE  
of using veneered chipboard for  
the wardrobe.  
(3 marks)**

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**(Total for Question 1 = 9 marks)**

**Turn over**



- 2 Look at Figure 2 for Question 2 in the Diagram Booklet. It shows a packing case used in the transportation and delivery of consumer products.**

**The packing case is folded from a single piece of board in the form of a net.**

- (a) State TWO types of board that would be suitable for making the packing case.  
(2 marks)**

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

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**(continued on the next page)**

**Turn over**

**2 continued.**

**(b) The graphics on the packing case will be printed using black ink.**

**Each packing case requires 2·5ml of ink.**

**Ink is supplied in 1·5 litre containers.**

**The manufacturer needs to print graphics on 3,500 packing cases.**

**The manufacturer buys sufficient full containers of ink to complete the print run.**

**Calculate how many extra packing cases the manufacturer could print before running out of ink.  
(5 marks)**

**Answer space continues on the next page.**

**Turn over**

**2(b) continued.**

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

**(Total for Question 2 = 7 marks)**

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**Turn over**

- 3 Look at Figure 3 for Question 3 in the Diagram Booklet. It shows an organiser that has been vacuum formed.**

**Vacuum forming requires a mould, in the form of the finished product, to be made for use in the manufacturing process.**

**One feature of the mould is that there are no undercuts that would lock the plastic around the mould and prevent its removal.**

**(continued on the next page)**

**3 continued.**

**(a) Explain ONE other feature of the mould that improves / aids productivity and quality.  
(2 marks)**

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**(continued on the next page)**

**3 continued.**

**(b) Describe the vacuum forming process, using annotated sketches.  
(4 marks)**

**(continued on the next page)**

**Turn over**

**3 continued.**

**(c) Explain two DISADVANTAGES of the vacuum forming process.  
(6 marks)**

**Answer space continues on the next page.**

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**Turn over**

**3(c) continued.**

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**(Total for Question 3 = 12 marks)**

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**4 Manufacturers use project management strategies such as scrum when designing and developing new products and production systems.**

**(a) Give the THREE roles within the scrum team.  
(3 marks)**

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

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

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**4 continued.**

**(b) Outline the key features of the  
scrum process.  
(6 marks)**

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**Turn over**

**4(b) continued.**

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**(continued on the next page)**

**4 continued.**

**(c) Products need to be protected to prevent other manufacturers making exact copies of the form and function of the product.**

**Give TWO methods of protecting the form and function of the product.  
(2 marks)**

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

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

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**(continued on the next page)**

**Turn over**

**4 continued.**

**(d) Discuss how the design and manufacture of consumer products can minimise the impact of the products on the natural environment.  
(9 marks)**

**Answer space continues on the next 4 pages.**

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**Turn over**

**4(d) continued.**

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**4(d) continued.**

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**(Total for Question 4 = 20 marks)**

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- 5 Look at Figure 4 for Question 5 in the Diagram Booklet. It shows a table of sales for different styles of car.**

**The information is to be presented in the form of a pie chart.**

- (a) Calculate the sector angle for the three car types.**

**You must show your answer correct to 1 decimal place.  
(6 marks)**

**Answer space continues on the next page.**

**5(a) continued.**

**Sector angle hatchback**

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**Sector angle saloon**

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**Sector angle SUV**

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**(continued on the next page)**

**Turn over**

**5 continued.**

**(b) The prices of the cars are:**

**Hatchback – £24,500**

**Saloon – £32,400**

**SUV – £43,900**

**Calculate the mean sales price for  
the car sales shown in Figure 4.  
(2 marks)**

**Answer £ \_\_\_\_\_**

**(Total for Question 5 = 8 marks)**

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**Turn over**

**6 Look at Figure 5 for Question 6 in the Diagram Booklet. It shows a speedboat with a teak deck and a glass fibre (GRP) hull.**

**(a) The teak deck has been coated with a varnish.**

**Give TWO benefits of using varnish on the deck of the boat.  
(2 marks)**

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

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**(continued on the next page)**

**Turn over**

**6 continued.**

**(b) Explain TWO benefits of a boat hull that is made from GRP.  
(6 marks)**

**Answer space continues on the next page.**

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**6(b) continued.**

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**6 continued.**

**(c) The speedboat is produced to order in a small modern manufacturing facility using one-off production methods.**

**Discuss the characteristics and applications of quality assurance and quality control as they would apply to the manufacture of the speedboat.  
(6 marks)**

**Answer space continues on the next 2 pages.**

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**Turn over**



**6(c) continued.**

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**6(c) continued.**

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**6 continued.**

**Health and safety is very important to ensure the safety of the workforce.**

**(d) Name TWO key pieces of health and safety legislation that would protect the workforce during the manufacture of the speedboat.  
(2 marks)**

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**(continued on the next page)**

**Turn over**

**6 continued.**

- (e) The speedboat has undergone sea trials to test its performance and efficiency.**

**At its maximum speed of 90 km/hour the speedboat uses 13.62 litres of fuel per hour.**

**Calculate the cost of the fuel required for a 25km journey at maximum speed.**

**Fuel costs £1.65 per litre.  
(3 marks)**

**Answer space continues on the next page.**

**6(e) continued.**

**Answer £ \_\_\_\_\_**

**(Total for Question 6 = 19 marks)**

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- 7 Look at Figure 6 for Question 7 in the Diagram Booklet. It shows an isometric projection of a component.**

**Designers use a range of different drawing techniques to convey their design ideas.**

**Look at the grid for Question 7 in the Diagram Booklet. Draw an accurate 3rd angle orthographic projection of the component.**

**Use the grid provided at a scale of 1 square = 1 cm.**

**You should start at line A–B which has been shown for both the front and side elevation.**

**You must include sufficient dimensions on your drawing to allow a 3rd party to produce the component.  
(6 marks)**

**(Total for Question 7 = 6 marks)**

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**Turn over**

- 8 Look at Figure 7 for Question 8 in the Diagram Booklet. It shows a pencil sharpener designed by Raymond Loewy.**

**Discuss the style and design philosophy of the Streamlining Movement and how it may have influenced the design of the pencil sharpener in Figure 7.**

**(9 marks)**

**Answer space continues on the next 4 pages.**

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**8 continued.**

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**(Total for Question 8 = 9 marks)**

**Turn over**

- 9 Manufacturers utilise a number of systems when manufacturing consumer products.**

**Discuss the benefits to the manufacturer of quick response manufacturing (QRM).  
(9 marks)**

**Answer space continues on the next 6 pages.**

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**9 continued.**

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**(Total for Question 9 = 9 marks)**

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**10 Quantum tunnelling composites are now widely used as inputs to electronic products.**

**Explain THREE uses of quantum tunnelling composites in electronic products.  
(9 marks)**

**Answer space continues on the next 3 pages.**

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**(Total for Question 10 = 9 marks)**

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**11 Look at Figure 8 for Question 11 in the Diagram Booklet. It shows a bedside lamp.**

- **The lamp can be switched on or off by touching either the base or tubular support.**
- **Three levels of lighting are available, by touching the base or support one, two, or three times.**
- **The lamp switches off after the fourth touch of the base or support.**
- **The lamp can use either LEDs or halogen bulbs.**
- **The base is made out of stainless steel and has rubber on the underside.**
- **The lamp weighs 2.7 kg.**
- **The overall height of the lamp is 330 mm.**
- **The diameter of the lamp base and shade is 130 mm.**

**(continued on the next page)**

**Turn over**

**11 continued.**

**Evaluate the functionality of the bedside lamp with reference to aesthetics and user requirements within a home setting.**

**(12 marks)**

**Answer space continues on the next 6 pages.**

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**11 continued.**

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**(Total for Question 11 = 12 marks)**

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**TOTAL FOR PAPER = 120 MARKS**  
**END OF PAPER**