

## Design & Technology

# Computer Aided Design

### Materials required for questions

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- Pencil
- Rubber
- Calculator

### Instructions

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- Use black ink or ball-point pen
- Try to answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

### Advice

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- Marks for each question are in brackets
- Read each question fully
- Don't spend too much time on one question

## Good luck!

**Q1.** CAD stands for?

- A** Computing and design
- B** Computer-aided diagram
- C** Computer-aided design

**Q2.** CAM stands for?

- A** Computer-aided manufacture
- B** Computer-aided making
- C** Computer-aided modelling

**Q3.** What is prototype?

- A** A scaled-down model of a product
- B** A non-working model of the product
- C** A working model of a product made to test before production

**Q4.** What is 3D printing a type of?

- A** Computer-aided manufacture
- B** Computer-aided design
- C** Isometric drawing

**Q5.** A schematic diagram is made up of what?

- A** Vanishing points
- B** Symbols
- C** Perspectives

**Q6.** What is a vanishing point?

- A** A coordinate in CAM
- B** A point on the horizon where all lines meet
- C** A symbol on a circuit diagram

**Q7.** Three dimensional (3D) drawings communicate information in different ways to two dimensional (2D) drawings.

Describe two advantages 3D drawing has over 2D drawing **(4 marks)**

Advantage 1:

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Advantage 2:

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**Q8.** A virtual model of a new hockey stick has been created. Explain **two** reasons for creating a virtual model of a new hockey stick **(4 marks)**

1.

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2.

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**Q10.** Describe **two** advantages of virtually modelling and testing a final design using CAD before starting manufacture **(4 marks)**

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2.

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**Q11.** Give **two** benefits of producing a virtual architectural model of a building **(2 marks)**

1.

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2.

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## Answers

**Q1.** C

**Q2.** A

**Q3.** C

**Q4.** A

**Q5.** B

**Q6.** B

**Q7.**

A maximum of **two** marks for each advantage. One mark for each correct advantage with a second mark awarded where response is clarified/ additional detail is provided

One mark answers:

- You can see at least 3 sides of the object drawn (1)
- Drawing is more realistic (1)
- Create an artist's impression of an object (1)

Two mark answers:

- 3D drawing provides a more realistic view of how the drawn product might look in real life (2)
- 3D drawing gives the viewer opportunity to imagine how the drawn product might feel when held / used (2)
- 3D drawing can be used to create a perspective view of an object, eg 1, 2 or 3-point perspective (2)
- Can be used to show how a product can be assembled, eg exploded drawings (2)
- Makes it easier to understand how to assemble flat pack furniture as you can see how the different parts/components relate to each other (2)
- You can see at least 3 sides providing detail of sizes and proportion (2)

**Q8.**

Any **two** reasons explained from:

- Products can be viewed / seen all round / 3D / see what it looks like / coloured / textures added (1) therefore a true and accurate representation can be gained from the computer model (1)
- Designs can be edited / modified / viewed all round on screen without having to redraw / physically modelled (1) which saves time / materials / speeds up any development (1)
- Files can be sent electronically via email (1) which saves time / reduces costs / speeds up the whole design and make process (1)
- Files can be output to 3D printing / rapid prototyping machines (1) which enables real models to be produced to test / hold / evaluated (1)
- Computer simulations such as stress / strain tests can be carried out (1) which will allow the designer to see if the hockey stick will be able to withstand the forces / impacts it will be subjected to when playing (1)

Q9.

**Advantages**

- Can test weights/destructive testing (1)
- Can simulate production times (1)
- Calculate material costs (1)
- Files can be transferred electronically (1)
- Ideas easily edited/amended (1)
- Library of standard components/stock size materials (1)
- Anthropometrics/Ergonomic data accessed via databases (1)
- Can be output to 3D printing (1)
- Can view design from all angles (1)
- Colours and textures can be changed easily (1)
- Easily dimensioned for cutting lists (1)
- No need to purchase modelling materials (1)
- Reduced demand on resistant / compliant materials for modelling (1)

**Disadvantages**

- High cost/expensive set up (1)
- Highly skilled operative required / training issues (1)
- Power-cuts can lose work/loss of files if not backed up (1)
- Unable to physically test until prototype is produced (1)
- Continual development/upgrade of software/hardware required (1)
- Potential threat of hacking / cyber theft / ransom (1)

If the answer only includes advantages or only includes disadvantages, a maximum of **four** marks will awarded

**Q10.**

**Two** advantages described from:

- Products can be coloured/textured (1) to show what they will look like in real life/viewed from all angles (1)
- Designs can be changed easily (1) without having to redraw the whole thing (1)
- Files can be sent electronically via email (1) which saves time and money (1)
- Electronic files can be linked to CAM machines (1) so that prototypes / models can be manufactured (1)
- Performance modelling can be carried out (1) to test to destruction / see how strong / safe it is (1)
- Reduce costs / saves money (1) as products do not need to be made for testing (1)
- Material dimensions / properties can be changed (1) to identify the areas where less / more material may be needed (1)
- All aspects are correct (1) before committing money which would be wasted if there were errors (1)
- Customer feedback can be gathered (1) to see if it would sell / market research (1)
- To see if individual pieces fit together (1) will reduce waste / materials / save time before manufacturing

**Q11.**

**Two** from the following:

- Provides a photorealistic view of the building (1)
- Architectural model can be placed in its proposed location (1)
- Allows experimentation with different external finishes (1)
- Allows redraws / amendments to be easily / quickly reflected in the architectural model (1)
- Can be shared electronically to be viewed in other locations (1)
- Both internal and external views can be seen (1)
- Can zoom it to look at specific details (1)
- Can be used to produce a walk through (1)

**Q12.**

**Physical prototypes**

- Physical prototypes can be quickly realised through Styrofoam modelling or rapid prototyping without huge expense to the designer (1)
- Ergonomic features can be modelled and tested with target user groups gaining direct feedback which can help them further development and refinement of the design (1)
- The function of mechanisms and dynamic features such as hinges or buttons can be tested (1)
- Observations of how potential user groups interact with the product can be made (1)
- Designers can use the physical model to test the aesthetic form and appearance of the product, developing and adjusting the design where necessary (1)
- Physical prototypes can be finished to represent the aesthetics of the final product allowing users or clients to provide detailed feedback that can be used by the designer (1)

## **Virtual prototypes**

- Manufacturing methods can be explored and tool paths simulated identifying issues before manufacture or financial investment in tooling or machining (1)
- Virtual prototypes can be used by CFD programs to test and simulate fluid and air flow. Data can be used by designers to improve aerodynamics (1)
- Financial savings will be made by negating the need for specialist testing of the physical model (1)
- Assembly of components can be tested to ensure compatibility with larger systems (1)
- FEA modelling can take place to simulate stresses of the physical product in use, saving time and money on physical modelling (1)
- Virtual prototypes can be quickly edited and materials and textures easily applied to represent a physical product (1)
- Virtual prototypes can be quickly shared with clients and manufacturers around the world (1)