



3D CAD

Level 1

Typically, pupils should show evidence of being able to:

- View a variety of product design illustrations (for example CAD drawings and online images) the teacher has provided and take part in a teacher-led discussion on product design. Explore basic features in the 3D CAD software. (Explore)
- Create their own basic shape with the teacher's help. (Express)
- Be aware that digital methods can be used to communicate. (Exchange)
- Talk about their design, led by the teacher. (Evaluate)
- Print or show their work with the teacher's help. (Exhibit)

Level 2

Typically, pupils should show evidence of being able to:

- Choose ideas to use in their own work, from a bank of images of product designs the teacher has provided. Carry out a series of instructions using the 3D CAD software. *This might include making shapes and adding colour.* (Explore)
- Create a basic shape with the teacher's help. (Express)
- Identify and talk about how to use different digital methods to communicate. (Exchange)
- Talk about how to improve their work, prompted by the teacher. (Evaluate)
- Save their work and/or show it to the class or group with the teacher's help. (Exhibit)

Level 3

Typically, pupils should show evidence of being able to:

- Research existing examples of product designs produced using 3D CAD software, identifying the main features of the design. Carry out and edit a series of instructions using the 3D CAD software. *This might include making and defining shapes and extruding.* (Explore)
- Create a simple product or component of a product. *This might include using colour, awareness of scale etc.* (Express)
- Use a contemporary digital method to communicate or contribute to a supervised online activity. *This might include sending an email or making a post to a wiki, blog or discussion thread. The email or post might be to a teacher.* (Exchange)
- Make some modifications to improve their design. *This might include changing a dimension or modifying a shape.* (Evaluate)
- Save their design with a filename and/or show it to the class or group. (Exhibit)



Level 4

Typically, pupils should show evidence of being able to:

- Research and select examples from a range of sources in order to compare and contrast product designs, showing an awareness of audience and purpose. Investigate and solve the problem set in the task brief, by experimenting with different software features before deciding which to use. *This might include rendering or lighting.* (Explore)
- Create a component or a product that demonstrates an awareness of the audience and purpose defined in the task brief. *This might include showing an awareness of scale and incorporating colour and rendering. This might include using a single tool such as extrude and appropriate rendering tools such as gradient fill, shadow or texture, to enhance the design for audience and purpose. This might also include some dimensions and notes about the product's function and the illustration's purpose.* (Express)
- Use one or more contemporary digital methods to communicate, exchange and collaborate in supervised online activities. *This might include sending an email with an attachment or making several relevant posts to a wiki, blog or discussion forum.* (Exchange)
- Use appropriate ICT tools and features to improve their work. *This might include experimenting with different approaches before choosing the most effective method.* (Evaluate)
- Save the product design in a named folder or class e-portfolio. (Exhibit)

Level 5

Typically, pupils should show evidence of being able to:

- Research and select more relevant examples and solutions from a range of digital sources in order to compare and contrast product designs, taking into account audience and purpose as defined in the task brief. *This might include a product analysis or evaluation. Investigate and solve the problem set in the task brief by selecting appropriate 3D CAD software to use a range of software tools and features. This might include experimenting with proposed solutions and might include relevant details such as size, material, functions and component pieces.* (Explore)
- Create a viable CAD drawing that combines a range of features to demonstrate a clear understanding of the audience and purpose defined in the task brief. *This might include using a range of software features and tools such as extrude, fillet, chamfer and emboss, along with fully annotated drawings using dimensions and text, demonstrating a clear understanding of audience and purpose.* (Express)
- Use a range of contemporary digital methods to communicate, exchange and share their work, collaborating online with their peers. *This might include working online to create a design, or discussing, debating and/or negotiating online about which features to include in their design.* (Exchange)



- Use the 'plan, do, review' cycle to improve their work for the audience and purpose defined in the task brief. *This might include designing, drafting and refining their work to make it relevant for the audience and purpose defined in the task brief. This might also include asking peers to give feedback on their design.* (Evaluate)
- Organise, store and maintain the product design and any associated files and/or materials in a personalised area to showcase learning digitally across the curriculum. (Exhibit)

Level 6

Typically, pupils should show evidence of being able to:

- Research and investigate more relevant existing product designs and solutions from a range of digital sources, justifying and referencing their sources in relation to the specific audience and purpose defined in the task brief. Experiment with a wider range of tools and features in the 3D CAD software. *This might include a detailed product analysis or evaluation relevant to the requirements identified in the task brief and some experimentation with aesthetics for a high quality product design and manipulation of solid models.* (Explore)
- Identify user requirements and plan and develop a product design that includes a range of more sophisticated features and has a consistent look and feel. *This might include an assembly of component parts that need to be combined from separate drawings. This might also include an annotated orthographic working drawing, considering dimensions and scale.* (Express)
- Use a range of contemporary digital methods to communicate, exchange and share their information and multimedia products, collaborating with peers, experts and end users. *This might include collaborating on the design with peers, for example sharing it in a discussion forum and allowing contributors to use collaborative features of the software, such as track changes or automated file versioning, to add quality comments and justifications directly onto the publication.* (Exchange)
- Justify the application they chose to complete the CAD task, the alternatives they considered and the process they carried out in producing the design. Justify how their product meets the requirements of specified audience and purpose. *This might include identifying and describing the development process and identifying key points where they made value judgements that enhanced the final version of the design.* (Evaluate)
- Organise, store and maintain their work in a personalised area to showcase learning digitally across the curriculum. (Exhibit)



Level 7

Typically, pupils should show evidence of being able to:

- Research and select the most relevant assets from a range of digital sources, found and created, discriminating between these for relevance, reliability and accuracy, justifying and referencing their sources. Select and justify the most appropriate software package and features to use to meet the requirements of the end user defined in the task brief. *This might include researching and selecting designs and other assets and experimenting systematically with a range of designs, deciding on the most appropriate to meet the target audience's expectations, using a development cycle to routinely test and adjust their product prototype, and justifying choices and decisions based on their original intentions, group discussions and feedback from end users.* (Explore)
- Set out clearly defined user requirements and plan and create an original sophisticated product design, using a range of advanced 3D CAD features in a discerning way to meet the expectations of the client or audience defined. *This might include accurate and high quality annotated working drawings using recognised orthographic standards, including appropriate detail such as sectioned views, hidden detail or feature highlights. This might also include combining multiple part files to produce an assembly of components that form the completed product.* (Express)
- Exploit contemporary communication methods to exchange, share and collaborate on their developed ideas and information with peers, experts and end users, contributing to a collaborative global environment. *This might include uploading the design to a blog to gather feedback from peers, experts and end users, acting on this in a discriminating way to further enhance the high quality and suitability of the product or information assembled for an end user defined in the task brief.* (Exchange)
- Identify, with increasing discernment, the end user's requirements and the task's purpose at the outset, and review systematically the final design against the requirements at the end of the process, clearly identifying which have been met and which have not. *This might include gathering end user feedback and making further refinements or setting out recommendations for improvement.* (Evaluate)
- Manage and present a logically structured digital bank of work to showcase learning across the curriculum, taking account of format, portability, size, copyright and versioning. *This might include backing up files to an alternative location, managing multiple versions and choosing appropriate formats and resolutions.* (Exhibit)

Pupils should demonstrate, when and where appropriate, knowledge and understanding of e-safety, including acceptable online behaviour.