

COMPUTER AIDED DESIGN

GRAPHIC COMMUNICATION



NAME: _____

TEACHER: _____

READ ME!

Computer Aided Design is an essential part of the Graphic Communication course. It builds upon the Technical Graphics unit that you should have completed before now.

You are expected to be able to use 2D and 3D CAD software to a good level. You should be able to quickly make 3D models, drawings and renders from given sketches or drawings.

In this unit, you will learn about 3D CAD and the terms associated.

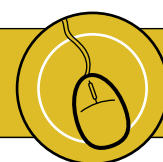
There are 24 tasks for you to produce, available at DesignClass.co.uk

You should produce these models and create drawings and renders to a sufficient standard. Your teacher will mark your work and provide feedback.

This booklet also covers most the knowledge required for an exam, along with covering the terminology and understanding required. Your teacher will mark your work. Make sure you pass it to them.

FIND STUFF!

Question description goes here.
Stem of the question goes here.



You can find relevant documents at these two site:

Past exam papers and Course Specification:

<https://www.sqa.org.uk/sqa/47459.html>

Taks, templates and videos:

<https://www.designclass.co.uk/n5-graphic-communication.html>

KNOW THESE!

There are 36 terms that you must understand for this part of the course. A checklist is shown below. You will cover these terms during this unit and answer questions in the following pages.



Line	<input type="checkbox"/>	Pattern Fill	<input type="checkbox"/>	CAD Library	<input type="checkbox"/>
Circle	<input type="checkbox"/>	Scale	<input type="checkbox"/>	3D Print	<input type="checkbox"/>
Ellipse	<input type="checkbox"/>	Import & Export	<input type="checkbox"/>	STL File	<input type="checkbox"/>
Arc	<input type="checkbox"/>	Extrude	<input type="checkbox"/>	Paperless Office	<input type="checkbox"/>
Rectangle	<input type="checkbox"/>	Revolve	<input type="checkbox"/>	Touchscreen Devices	<input type="checkbox"/>
Copy	<input type="checkbox"/>	Shell	<input type="checkbox"/>	CAD Manufacture	<input type="checkbox"/>
Zoom	<input type="checkbox"/>	Subtraction	<input type="checkbox"/>	Remote Working	<input type="checkbox"/>
Mirror	<input type="checkbox"/>	3D Chamfer	<input type="checkbox"/>	Textures	<input type="checkbox"/>
Trim	<input type="checkbox"/>	3D Filler	<input type="checkbox"/>	Materials	<input type="checkbox"/>
Rotate	<input type="checkbox"/>	Mate	<input type="checkbox"/>	Lighting	<input type="checkbox"/>
2D Chamfer	<input type="checkbox"/>	Align	<input type="checkbox"/>	File Management	<input type="checkbox"/>
2D Fillet	<input type="checkbox"/>	Centre Axis	<input type="checkbox"/>	Digital Rights & Copyright	<input type="checkbox"/>

UNDERSTANDING CAD!

Historically, drawing boards were used to create technical and engineering graphics. CAD software has totally replaced manual drawing boards in graphics industries. You will learn how to use CAD to prepare you for life after school.



CAD WORKSTATION

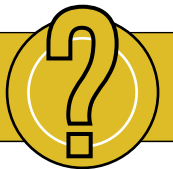
VERSUS



DRAWING BOARD

CAD workstations have entirely replaced manual drawing boards.

Describe three advantages CAD workstations offer over traditional manual drawing boards.



[3 MARKS]

CAD software can be expensive.

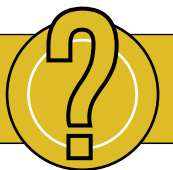
Research three different 3D CAD platforms, from three different companies. **State** the cost of these.



[3 MARKS]

CAD workstations are more than basic computers. They can also be expensive.

Describe the core components of a CAD workstation and the typical cost of such a computer.



[4 MARKS]

BASIC CAD!

Different Computer Aided Design software can have different functions and capabilities. Engineers and designers will select different software depending on their requirements. However, most 3D CAD software will have the four basic capabilities shown below.

SIMULATION!

MANUFACTURE!



RENDERING!

DRAWING!

CAD software is increasingly powerful and capable. Different software companies are constantly striving to improve the functionality of their products.

Four basic functions are shown. Describe each function and why they are important to 3D CAD software.

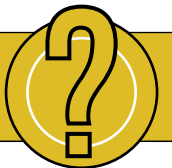
[8 MARKS]

Software is increasingly being sold via a monthly 'subscription' model, rather than sold for a fixed price. **Describe** why software companies use a subscription model. Include advantages and disadvantages.




[4 MARKS]

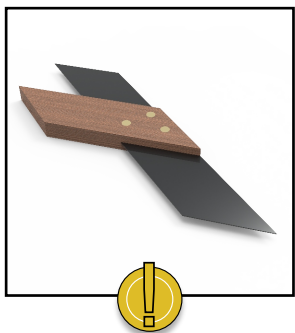
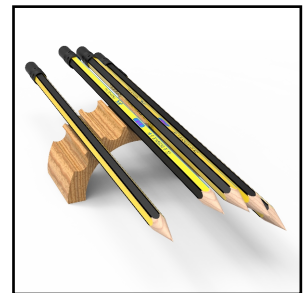
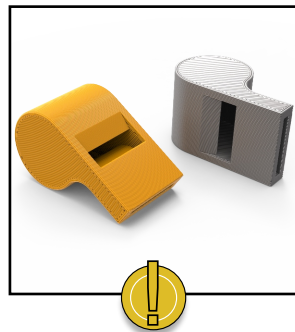
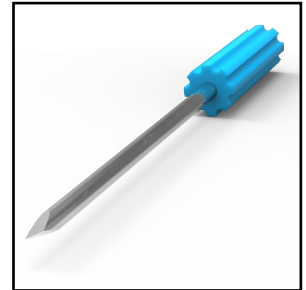
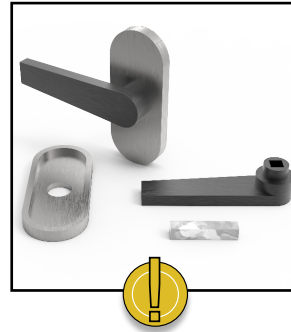
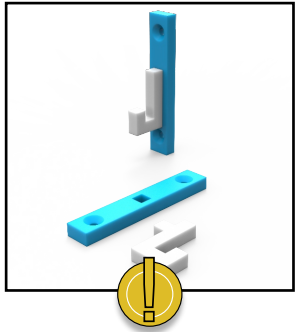
'Cloud storage' is an important tools for users of 3D CAD. **Describe** of the term '**cloud storage**', and why it is relevant to 3D CAD.



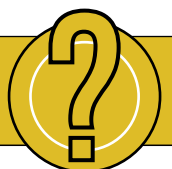
[4 MARKS]

EXTRUDE THESE!

There are 12 tasks in the 'extrude' category. Six of these tasks are mandatory as they cover particularly important skills and processes. These are marked with a . Use the list below to keep a record of which tasks you have completed.



The command to 'extrude' as an essential tool for all 3D CAD software.
Describe the 'extrude' command. Use sketches to support your answer.



[2 MARKS]

BASIC CAD!

This simple task - a wall hook - covers basic 3D skills to produce a simple two-part product. You need to understand how create sketches, extrude profiles, chamfer edges and assemble components. A tutorial video is available.

CAD Terminology is important to understand.

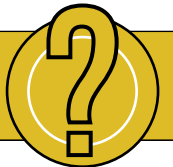
Describe the term '**Workplane**', and how it relates to 3D CAD. Use sketches to support your answer.



[2 MARKS]

CAD Terminology is important to understand.

Describe the term '**Sketch**', and how it relates to 3D CAD. Use sketches to support your answer.

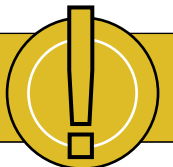


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



LINE & RECTANGLE

CIRCLE, ELLIPSE & ARC

EXTRUDE

[2 MARKS]

[2 MARKS]

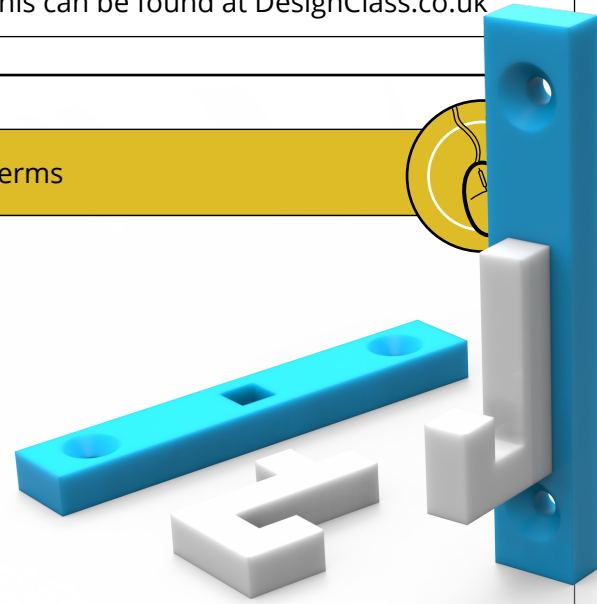
[1 MARK]

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
You must reference the sizes and geometry from the technical drawing. This can be found at DesignClass.co.uk

ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

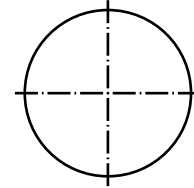
TEACHER CHECKED?

BASIC TANGENCY!

Tangency is a mathematical concept, and perhaps the most important for CAD engineers. You need to understand tangency to draw many items. There are different tangency tools in CAD software, that your teacher will explain.

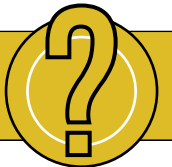
Tangency is a key tool for CAD engineers.
Describe tangency. Use sketches to explain your answer.





[2 MARKS]

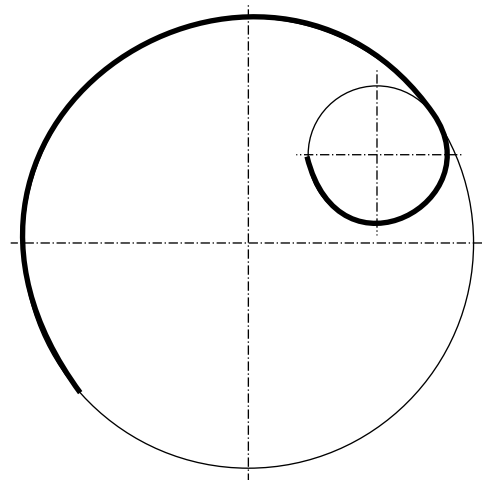
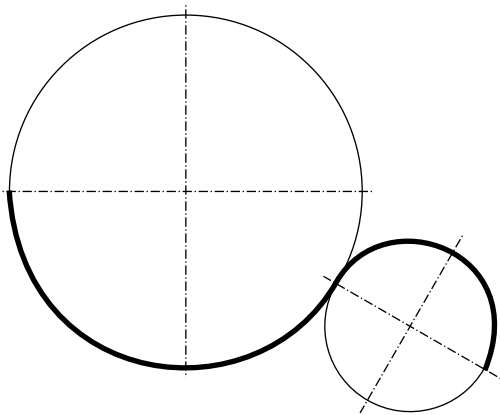
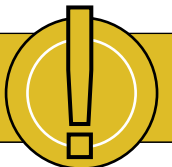
There are several terms associated with circles.
Describe the terms: 'diameter', 'radius', 'circumference', and 'centre line'.



[4 MARKS]

MEASURE THESE!

Tangent circles have been drawn to create compound curves.
Measure each circle and distance-between-centres. Apply dimensions to BS.8888



MODEL THIS!

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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

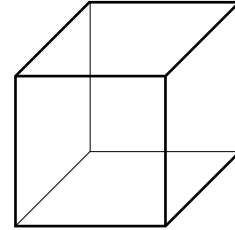
LOCATING VERTICES!

3D models can appear complex. However, all 3D items are made from faces, edges and vertices. CAD software basically edits these three features in different ways. Understanding faces, edges and vertices can help you model items.

All 3D models are made from 'faces', 'edges' and 'vertices'.

Describe the terms 'faces', 'edges' and 'vertices'. Use sketches to explain your answer.





[2 MARKS]

'Construction lines' and 'points' can be used to draw complex items.

Describe 'construction lines' and 'points', and how they can be helpful in drawing other items.

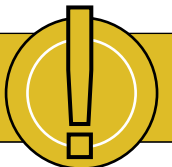


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



2D CHAMFER

[2 MARKS]

3D CHAMFER

[2 MARKS]

TRIM

[2 MARKS]

MODEL THIS!

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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

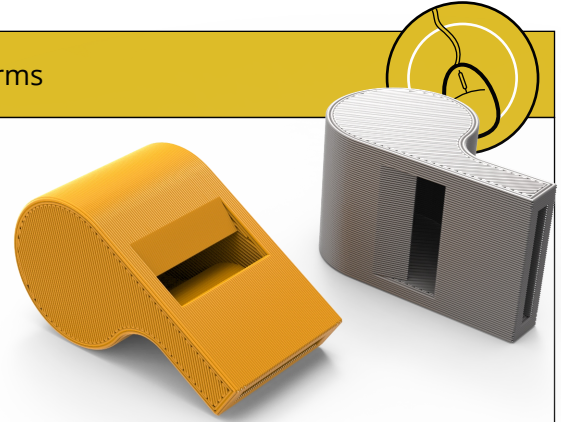
TEACHER CHECKED?

MODEL THIS!

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ANSWER HERE!

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DRAWING PRINTED?

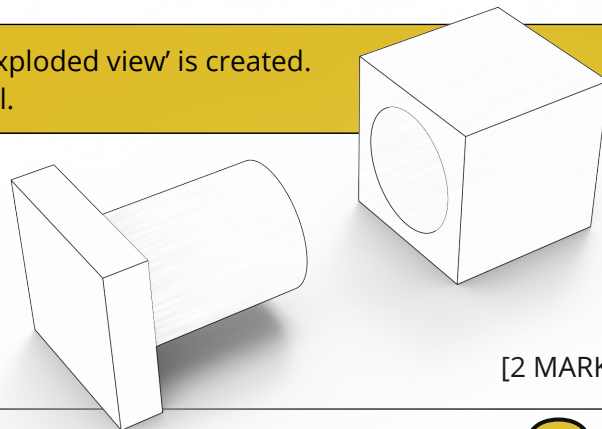
RENDER PRINTED?

TEACHER CHECKED?

UNDERSTAND ASSEMBLIES!

Assemblies are 3D models made of two-or-more parts, brought together like a real product. Unlike real products, where two components of identical size would suffer friction, 'or interference', CAD models go together perfectly.

Sometimes complex models are only partially assembled, and an 'exploded view' is created. Describe an 'exploded view', and the properties that make it useful.



[2 MARKS]

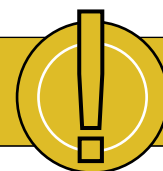
Items with multiple components may be broken down into 'sub-assemblies'. Describe a 'sub-assembly', and why they are useful.



[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers. Describe the following terms. You may use sketches to support your answers.



MATE

[2 MARKS]

ALIGN

[2 MARKS]

CENTRE AXIS

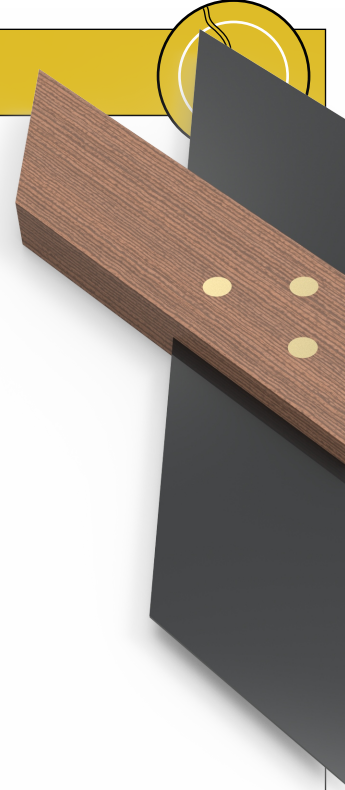
[2 MARKS]

MODEL THIS!

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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

UNDERSTAND REVOLVE!

The 'revolve' command can be found in every 3D CAD application. It is a powerful tool used to create curved or cylindrical items. It is essential that you become familiar with this command. You will practice the command in this section.

The command to 'revolve' is an essential tool for all 3D CAD software.
Describe the 'revolve' command. Use sketches to support your answer.



[2 MARKS]

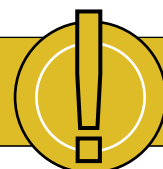
Axis are an important feature of all parametric 3D CAD software.
Describe the term 'Axis' in relation to 3D CAD. You may use sketches to support your answer.



[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.
Describe the following terms. You may use sketches to support your answers.



REVOLVE

2D FILLET


3D FILLET

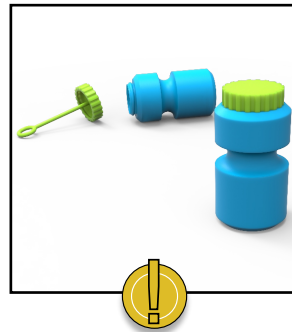
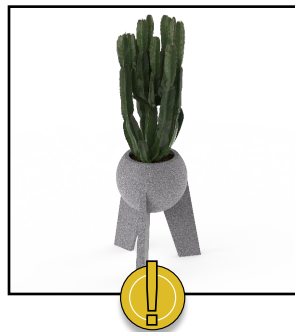
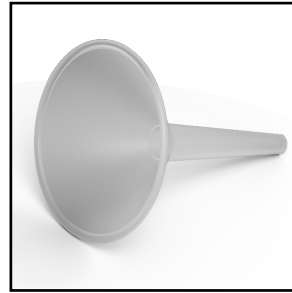
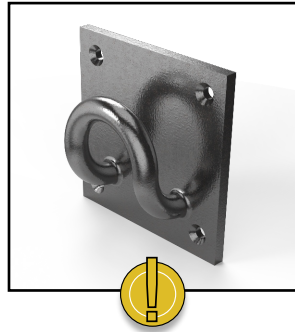
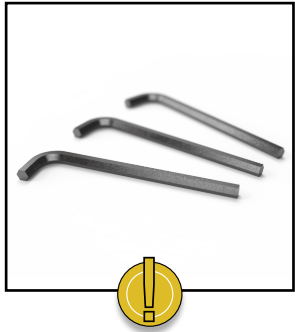
[2 MARKS]

[2 MARKS]

[2 MARKS]

REVOLVE THESE!

There are 12 tasks in the 'revolve' category. Six of these tasks are mandatory as they cover particularly important skills and processes. These are marked with a . Use the list below to keep a record of which tasks you have completed.



The CAD Challenges are supplied in .PDF.
Describe why **.PDF** is a suitable format to supply technical graphics.



[2 MARKS]

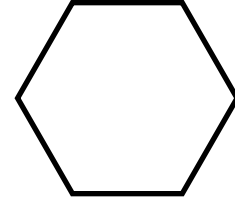
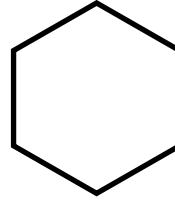
UNDERSTAND HEXAGONS!

Hexagons are a common geometry used in a wide range of products. Most CAD software will allow designers to draw hexagons directly from a palette of polygon shapes.

Hexagons can be measured in two different formats.

Describe the two formats used to measure hexagons. Measure and dimension the drawing shown.

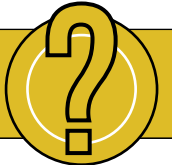




[2 MARKS]

British Standard, BS8888, are used for sharing technical graphics.

Explain why technical graphics follow the common format BS8888 in the UK.

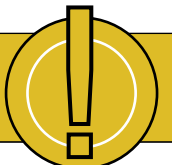


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



COPY

SCALE

ZOOM

[2 MARKS]

[2 MARKS]

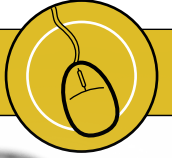
[2 MARKS]

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
You must reference the sizes and geometry from the technical drawing. This can be found at DesignClass.co.uk

ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

OFFSET REVOLVE!

Getting revolves to meet up is a complex procedure. Axis must be positioned correctly and the profile revolved by the angle.

Templates are often used to help create technical graphics.

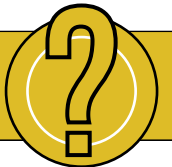
Explain why templates are used with 3D CAD software.



[2 MARKS]

Computers use mice as they most common input device for sketching or drawing on a computer.

Describe two alternative input devices that can be used to draw onto the computer.

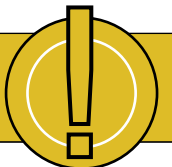


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



PAPERLESS OFFICE

TOUCHSCREEN DEVICE

CAD MANUFACTURE

[2 MARKS]

[2 MARKS]

[2 MARKS]

MODEL THIS!

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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

UNDERSTAND ARRAYS!

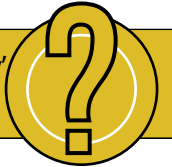
Arrays make it easy to model components with repeating features.
Learning how to create arrays of 2D sketches or 3D features can make it easier to create complex components.

Arrays are an important tool when creating CAD models.
Describe an **array**. Show two different types of array. Use sketches to support your answer.



[2 MARKS]

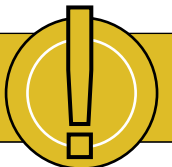
3D CAD models are frequently shared online via sites, such as 'GrabCAD', 'Thingiverse' and 'MyMiniFactory'.
Describe two considerations before sharing files online.



[3 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.
Describe the following terms. You may use sketches to support your answers.



CLOUD COMPUTING

DIGITAL WRITES & COPYRIGHT

FILE MANAGEMENT

[2 MARKS]

[2 MARKS]

[2 MARKS]

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
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ANSWER HERE!

Ensure you use correct CAD modelling terms



Large empty rectangular area for writing the answer.

DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

UNDERSTAND MIRRORING!

Sometimes things repeat themselves. Sometimes things repeat themselves. The mirror command can be used with 2D sketches or 3D features. Each method requires the same thing - a point when an object is mirrored.

All technical drawings require 'Title Blocks'.

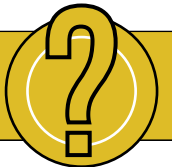
Describe the features a 'title block' requires. Support your answer by sketching a completed title block.



[4 MARKS]

'Pitch Circle Diameter' (PCD) is a frequently used CAD tool.

Describe the features of 'Pitch Circle Diameter'. Use sketches to support your answer.

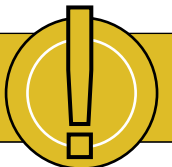


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



MIRROR

[2 MARKS]

CAD LIBRARY

[2 MARKS]

ROTATE

[2 MARKS]

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
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ANSWER HERE!

Ensure you use correct CAD modelling terms



A large, empty rectangular box with a thin black border, intended for the student to write their answer.

DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

ASSEMBLING CYLINDERS!

Assembling cylindrical components is usually very easy - centre axis. However, complex assemblies often require you to assemble components to different axis or workplanes. A video is available to show you more.

Design teams often use CAD libraries.

Explain why libraries of components are useful when generating assemblies. Provide three reasons.



[3 MARKS]

Design teams often work internationally and share 3D models via email.

Describe three possible problems with sharing 3D models via email.

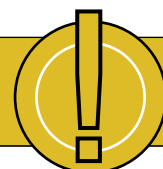


[3 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



TEXTURES

MATERIALS

LIGHTING

[2 MARKS]

[2 MARKS]

[2 MARKS]

MODEL THIS!

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ANSWER HERE!

Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?

COMING TOGETHER!

Time to bring all your 3D CAD skills together in this project. Can you successfully model two complex components that must fit together? If you can, you have gained the skills necessary to be successful with this unit. Well done!

Graphics can be produced as renders or line-drawings.

Describe the advantages of creating line drawings, either orthographic or pictorial, over renders.



[3 MARKS]

Technical graphics are typically line drawings.

Explain why fully rendered images may be more useful than line-drawings.

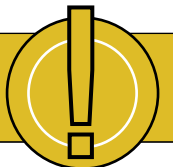


[2 MARKS]

DESCRIBE THESE!

Understanding technical terms is essential for CAD engineers.

Describe the following terms. You may use sketches to support your answers.



SHELL

[2 MARKS]

SUBTRACTION

[2 MARKS]

PATTERN FILL

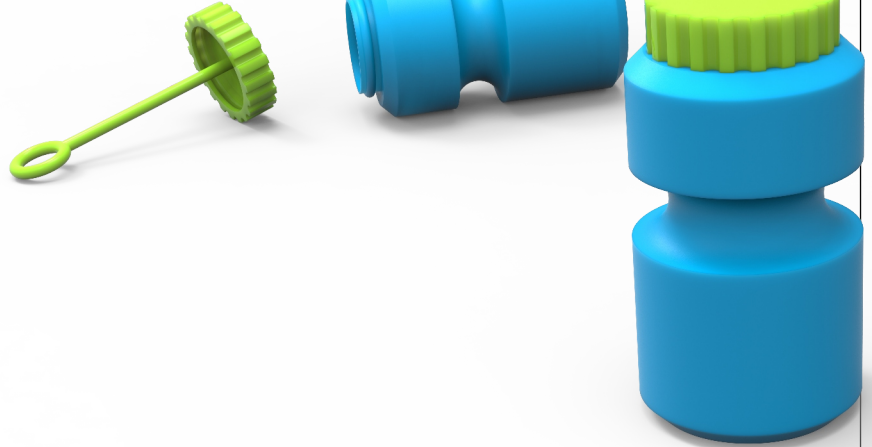
[2 MARKS]

MODEL THIS!

Describe the 3D CAD techniques used to model the part shown below.
 You must reference the sizes and geometry from the technical drawing. This can be found at DesignClass.co.uk

ANSWER HERE!

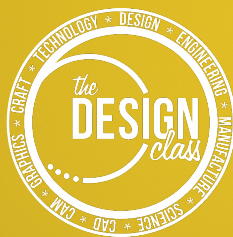
Ensure you use correct CAD modelling terms



DRAWING PRINTED?

RENDER PRINTED?

TEACHER CHECKED?



COURSE NOTES V1.0

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