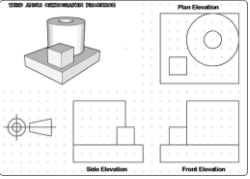
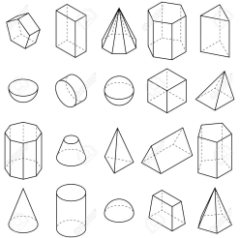
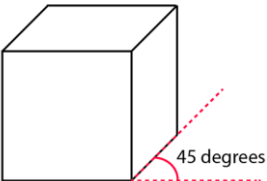
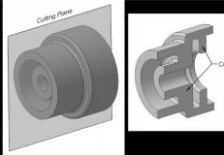
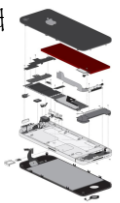


1. Interpretation Of 2D And 3D Engineering Drawings

1	Third Angle Orthographic Projection	Used in technical drawing and normally comprises the three views (perspectives): front, top and side. 
2	Isometric	A type of 3D drawing that is set out using 30-degree angles. 
3	Oblique	A simple type of technical drawing of graphical projection used for producing two-dimensional images of three-dimensional objects. 

2. Standard Drawing Conventions On Engineering Drawings

1	Sectional Views	A section looks inside an object. Sections are used to clarify the Interior construction of a part that can not be clearly described by hidden lines in exterior views . By taking an imaginary cut through the object and removing a portion, the inside features may be seen more clearly. 
2	Exploded Drawings	A type of drawing , that shows the intended assembly of mechanical or other parts. It shows all parts of the assembly and how they fit together. 
3	Tolerances	The allowable variation for any given size in order to achieve a proper function. Tolerance equals the difference between lower and upper limit dimensions. + / -.
4	Scale	The scale of a drawing is the ratio of a distance on the drawing to the corresponding distance in the real world . 1:2 means 1mm on the drawing equals 2mm in the real world. 1:5 scale would mean that 5mm in a drawing would equal 25mm when you make it.
5	Annotations	Extra information associated with a particular design / drawing on a document .It can be a note that includes a comment or explanation to clarify material choice, finish, process.

3. Production Of Plans For The Making Of A Pre-production Product

1	Interpretation of the details and requirements of a pre-production product from engineering drawings. What have you been asked to make? What size is it? How does it fit together? Is there any hidden detail you need to be aware of? Is there a scale on the drawing? When was the drawing completed? By whom? What version of the drawing do you have?
2	Sequence of operations and time estimate. Schedule a set of project activities which would enable manufacture of the component. The order in which you complete the tasks is crucial, however, there will be some tasks which can be completed 'out of order. Can a hole be drilled at the start of manufacture, or at the end?? You will need to consider every task and where it comes in the manufacture sequencing.
3	Tools, equipment and processes Consider which are the best tools / machines to use. You will have to consider quality of outcome, speed of manufacture, availability of equipment, quantity of manufacture.
4	Health and safety considerations PPE, Machine guarding, training, machine maintenance / set up.
5	Quality control checks: To check quality against a set standard or specification Visual inspection, measuring (calipers / micrometers / rules), templates, use of jigs, go/no go gauges.

1. Appropriate Processes For Making Pre-production Products,

1	Measuring Equipment	Know how to use; Rule; Digital Vernier Calliper; Micrometer
2	Marking Out Equipment	Know how to use; Scribe; Engineer's Try Square; Height Gauge 
3	Manually Controlled Machining	Know how to; Drill, Turn, Mill, Fabricate, Form.
4	How To Use Equipment	Setting Of Machines/Equipment; Milling Machines, Lathes, Drilling Machines

2. How To Use Tools And Equipment When Making Products

1	Milling machines	Used to machine flat surfaces, but can also produce irregular surfaces, or used to drill, bore, cut gears, or produce slots.
2	Lathes	Rotates a workpiece about an axis of rotation to perform various operations such as cutting, sanding, knurling, drilling, facing, and turning, with tools that are applied to the workpiece to create an object with symmetry about that axis.
3	Drilling Machines	Hand held, bench or floor mounted

3. How To Use Personal Protective Equipment (PPE) Appropriately

Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly.

1 Eyes	Hazards; Chemical or metal splash, dust, projectiles, gas and vapour, radiation PPE; Safety spectacles, goggles, face screens, faceshields, visors
2 Head and neck	Hazards; Impact from falling or flying objects, risk of head bumping, hair getting tangled in machinery, chemical drips or splash, climate or temperature PPE; Industrial safety helmets, bump caps, hairnets and firefighters' helmets
3 Ears	Hazards; Noise – a combination of sound level and duration of exposure, very high-level sounds are a hazard even with short duration Options; Earplugs, earmuffs, semi-insert/canal caps, ear defenders.
4 Hands and arms	Hazards; Abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, radiation, biological agents and prolonged immersion in water Options; Gloves, gloves with a cuff, gauntlets and sleeving that covers part or all of the arm Note; Avoid gloves when operating machines such as bench drills where the gloves might get caught
5 Feet and legs	Hazards; Wet, hot and cold conditions, electrostatic build-up, slipping, cuts and punctures, falling objects, heavy loads, metal and chemical splash, vehicles Options; Safety boots and shoes with protective toecaps and penetration-resistant, mid-sole wellington boots and specific footwear, eg foundry boots and chainsaw boots
6 Lungs	Hazards; Oxygen-deficient atmospheres, dusts, gases and vapours Options – respiratory protective equipment (RPE) Some respirators rely on filtering contaminants from workplace air. These include simple filtering facepieces and respirators and power-assisted respirators
7 Whole body	Hazards; Heat, chemical or metal splash, spray from pressure leaks or spray guns, contaminated dust, impact or penetration, excessive wear or entanglement of own clothing Options; Conventional or disposable overalls, boiler suits, aprons, chemical suits

Safe use of machines and equipment within the workshop involves **instructions**, **procedures**, and ongoing **training**. This is not something which is done once, but must be reviewed **regularly**.

1. Consideration Of Scales Of Manufacture

1	One-off/Job Production	Involves producing custom work , such as A one-off product for A specific customer or A small batch of work in quantities usually less than those of mass-market products
Birth day cake, F1 Car, Specialist jewellery, Large Buildings / Towers, Wedding Dress, Prosthetics for limbs. Skilled workforce, Specialist machines, High quality products manufactures, Expensive to buy / make, High standard of quality control, Made for a specialist client / market.		
2	Batch Production	A method of manufacturing where the products are made to specified amounts, within a time frame.
Flat packed furniture, Special edition cars, Baked goods, Clothing, Computer chips, Computer software, Electrical goods, Newspapers/magazines A production line is set up (one task for each stage) semi-skilled / unskilled workers (Flexible – can be redeployed to make another product), Production lines run for a limited period of time.		
3	Mass Production	Also known as flow production or continuous production , is the production of large amounts of standardized products, including and especially on assembly lines.
Recycling centers, Paper production, canned goods, over-the-counter drugs, some household appliances. The emphasis in mass production is on keeping manufacturing costs low by producing uniform products using repetitive and standardized processes. As products became more complicated to produce, mass production also became more complex.		
Automated production line, Unskilled / skilled workforce, Production line runs 24/7/365, A very high level of investment in machinery & equipment, Quality control at every stage of production.		

2. Impact Of Quantities Of Production On Production Plans

How do you move from making a prototype (One-Off) to its mass production. The same process is not feasible or profitable.

1	Processes	Be able to identify which processes are suited to different scales of production; Injection moulding, Die casting – Mass Production Investment casting – One-off / jobbing Vacuum forming, rotary moulding – Batch
2	Sequence Of Individual Operations	Be able to discuss the feasible operational sequence for a range of processes; Vacuum forming, Pewter casting
3	Timing Of Stages	How long will each stage take, how long will you have to wait between processes? (Adhesives / plastics to cool etc.)
4	Health And Safety Considerations	Refer to R110, Lo2 for a list of PPE, but be able to identify / predict which PPE will be required for any process.
5	Quality Control Checks	Refer to R110, Lo2 for relevant measuring tools and to R109 for details of Testing (Destructive & Non-Destructive) to ensure the quality of each product is equal to the previous product or within tolerance if creating a product from specification.
6	Suggested Modifications	For upscaling production of products, you will be required to suggest alternate ways of manufacture of components. The same process used for making a single item will not be suitable for its successful mass production.

To get a concept of the scale of production of products watch 'How it's Made' films on YouTube. – Choose some of the products listed here;
<https://www.youtube.com/channel/UCELt4nocnWDEnYJmov4zqyA>