Practice Marking Materials for Technical Qualifications

2019

City & Guilds

1145 Technical Award in Engineering (1145-027 Manufacturing)

Introduction

The synoptic assignments for the City & Guilds Technical Qualifications are externally set summative assessments which are internally marked by tutors. It is the centre's responsibility to ensure candidates' work is marked in a standard way across the centre, using the specified marking grid, in order to rank performance on a single mark scale.

Practise marking materials are useful to support centre staff with internal standardisation and as a pre-standardisation activity. The materials are produced to support staff in the process of marking including how to effectively use marking grids and assessment objectives (AO).

The marking materials must be considered alongside the Technical qualifications Marking and Moderation Guide

It is recommended that all tutors, including any unlikely to mark, are included in early discussions around the use of the marking grid, as all tutors should understand the basis of marking as it could shape their teaching by helping candidates practise bringing their skills and knowledge together to complete a problem, and helping them learn how to explain and justify their choices in terms of the subject knowledge in preparation for summative assessment. Tutors must study the *Marking and Moderation Guide:* *https://www.cityandguilds.com/techbac/technical-qualifications/resources-and-support* which provides detailed information about generic assessment objectives, and the marking grid, to ensure they are clear about the different AOs and how they may show up in evidence for assignments in the subject area. If there is more than one tutor carrying out marking at the centre, this process should be carried out as part of a group activity to ensure all markers are clear and in agreement about what sorts of evidence are relevant for assessment and which AO they fit into.

The following materials could form the basis for pre-standardisation practice and discussion could take place using evidence from trial runs/formative assessment activities. Standardisation should also take place using the evidence from the actual assignment set for that year, so along with utilising this tool, please ensure that activities surrounding the 2019 assignment also take place.

Within this pack, you will find

- a sample task brief
- a copy of the marking grid used for the synoptic assessment
- a sample of materials responding to either last year's synoptic assignment or a sample set of tasks. This includes learner produced evidence and tutor observations of the practical performance.

And finally, the Principal Moderator has provided a breakdown of the marks for the different assessment objectives along with general hints and tips on the synoptic assessment.

Tasks

Task 1
Decide on the CAM processes and manual processes to be used to manufacture the components and generate any information required to support the manufacture.

- Analyse the provided drawings and sketches to determine which processes will be used to produce which features
- A production plan which includes:
  - a justification of the selection both in terms of the process and the level of automation
  - any specific requirements for machine set up and operation
- Produce a CAD drawing for the feature(s) which will be made on a CAM machine

What you must produce for marking:

- Production plan
- CAD drawing

Task 2
Produce CNC programs for any CAM machining operations and then manufacture the components.

- Produce CNC code for the feature(s) which will be made on a CAM machine
- Manufacture the product
- Evaluate the machined features against the specification

What you must produce for marking:

- Finished item
- G code or equivalent control for the CAM machine
- Test record sheet

Additional evidence of your performance that must be captured for marking:

- Your tutor's notes of your working practice describing the quality, consistency and accuracy of the finished work.
- Photographic or video evidence of the manufacturing activity

Conditions of assessment:

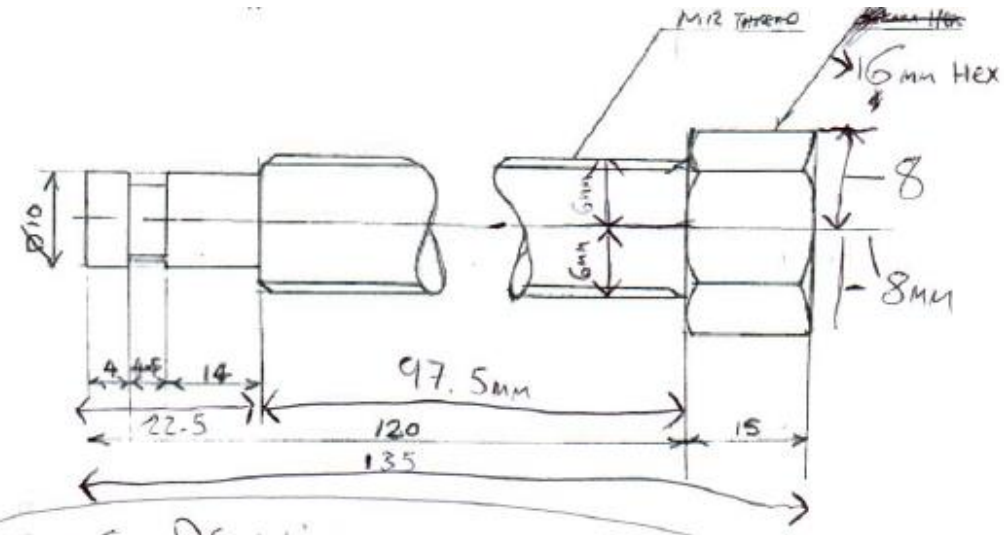
- You must carry out all tasks on your own, under supervised conditions.
- The use of non-programmable scientific calculators is allowed.
- Access to appropriate reference materials, such as component datasheets, is allowed. All reference material used must be listed within the assignment.

Appendix A

Specification

- Drawings of the product are shown in Figures 1 – 6
- Tolerance on length of pins and screw shafts to be +/- 2 mm
- Tolerance on angles to be +/- 2°
- Tolerance on all other dimensions +/- 0.4 mm
- When the product is assembled, turning the threaded shaft should open or close the clamp as appropriate.

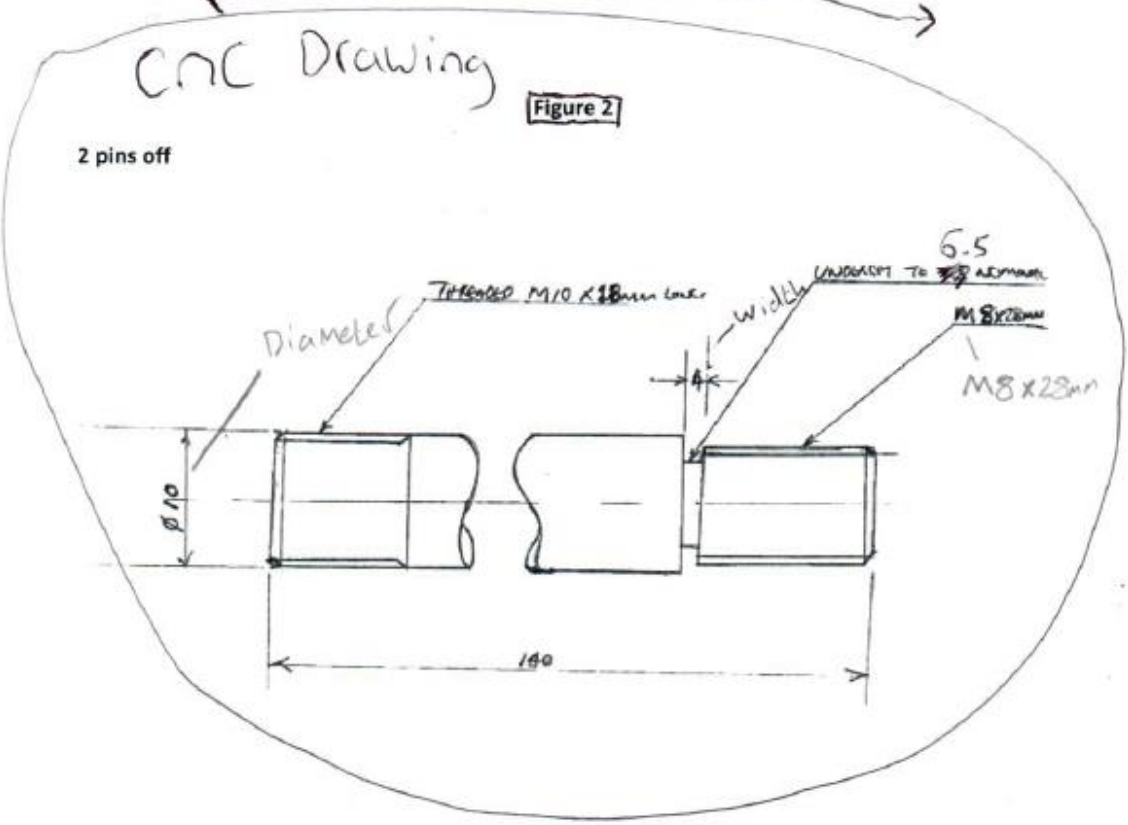
Assembled clamp (NOT TO SCALE)



CNC Drawing

Figure 2

2 pins off



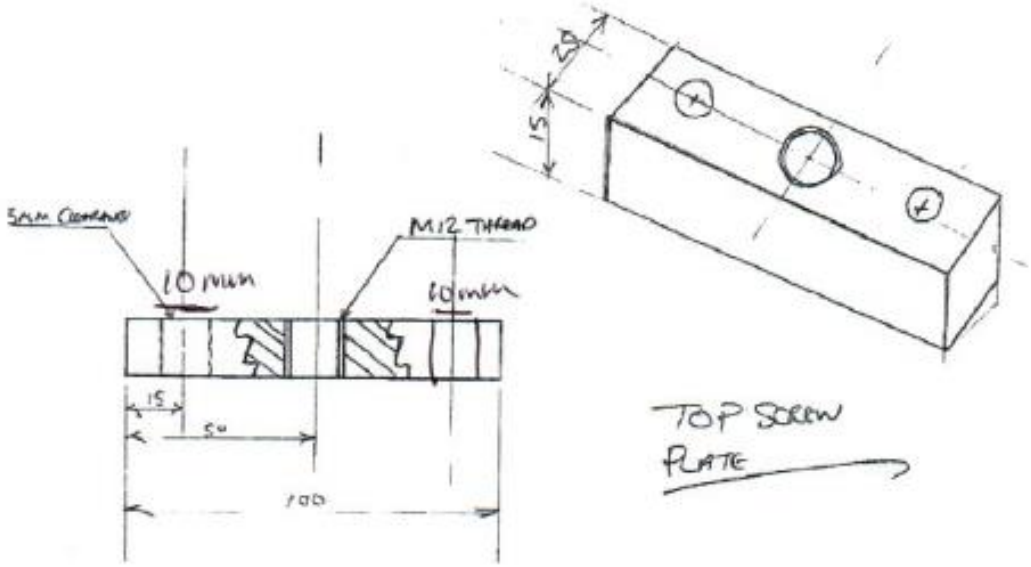
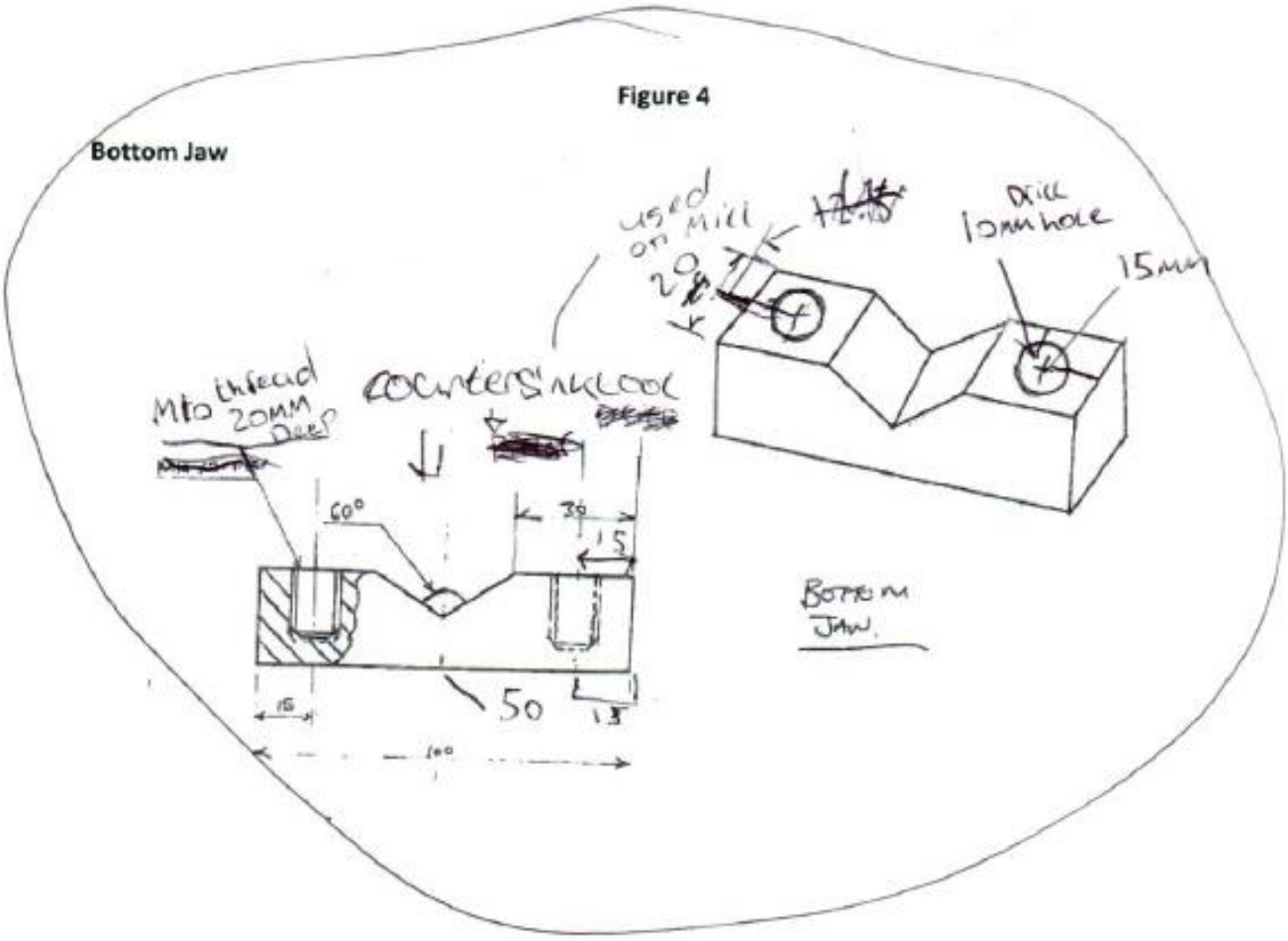


Figure 4

Bottom Jaw



Top Sliding Jaw

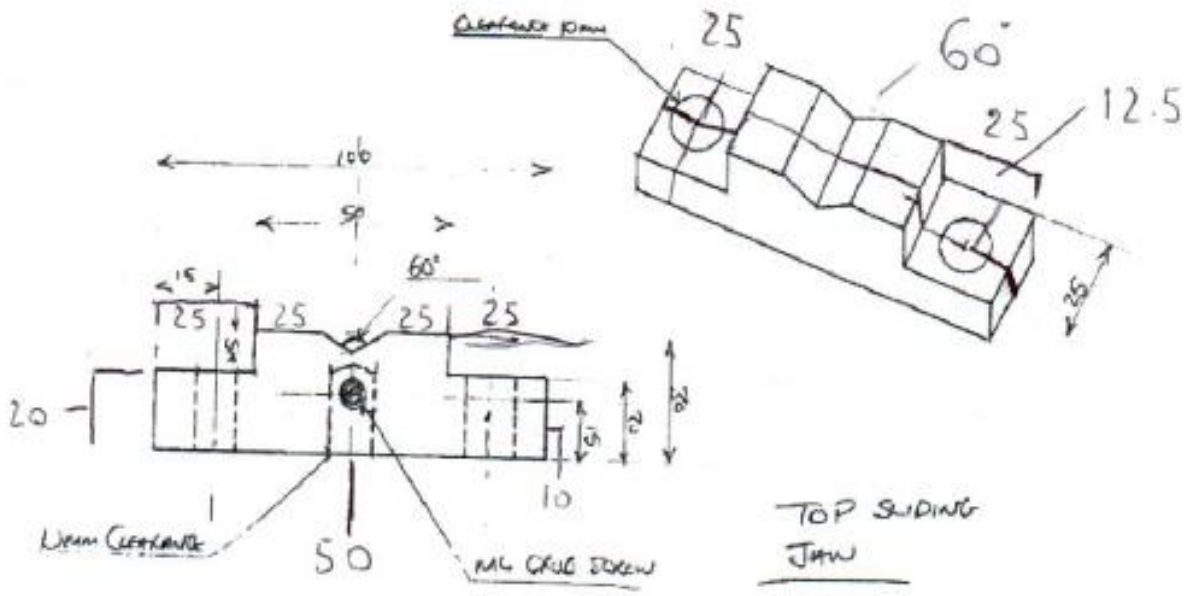
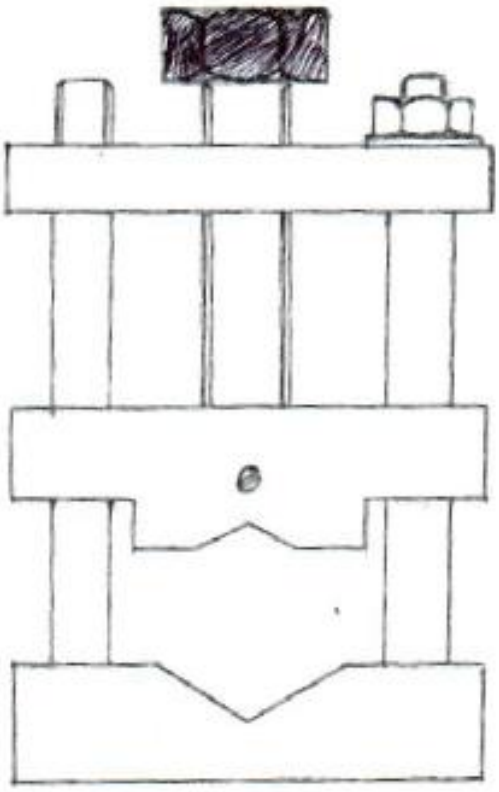


Figure 6



Section 2 Marking Grid

Marking grid

For any category, 0 marks may be awarded where there is no evidence of achievement

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
25	**AO1 Recall of knowledge relating to the qualification LOs** • Does the candidate seem to have the full breadth and depth of taught knowledge across the qualification to hand? • How accurate is their knowledge? Are there any gaps or misunderstandings evident? • How confident and secure does their knowledge seem?	**(1-5 marks)** **Recall shows some weaknesses in breadth and/or accuracy.** Hesitant, gaps, inaccuracy	**(6-10 marks)** **Recall is generally accurate and shows reasonable breadth. Inaccuracy and misunderstandings are infrequent and usually minor.** Sound, minimal gaps	**(11-15 marks)** **Consistently strong evidence of accurate and confident recall from the breadth of knowledge.** Accurate, confident, complete, fluent, slick
		Examples of types of knowledge expected: Identifying relevant data, drawings, specification and procedures, processes, resources including equipment, tools listed in manufacturing planning documents.		
		Bottom of band Candidate identified one piece of required data, Very limited information on available manufacturing processes. Identified one or two resource requirements. **Top of band** Candidate identified one or more pieces of required and relevant data, documents and specification; Some identification of a few manufacturing processes available. Identified a few resources including equipment and tools.	**Bottom of band** Candidate identified a few pieces of required and relevant data, documents and specification. Fair information on identified manufacturing processes available. Identified a few resources including equipment and tools. **Top of band** Candidate identified most of the required and relevant data, documents and specification. Good information on suitable manufacturing processes available. Identified most of the required resources including equipment, tools and consumables.	**Bottom of band** Candidate identified all of the required and relevant data, documents and specification. Good information on suitable manufacturing processes available. Identified all of the required resources including equipment, tools, and consumables. **Top of band** Candidate identified all of the required and relevant data, documents and specification. Detailed information on manufacturing processes available. Identified all of the required resources including equipment, tools and consumables.

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
15	**AO2 Understanding of concepts theories and processes relating to the LOs** • Does the candidate make connections and show causal links and explain why? • How well theories and concepts are applied to new situations/the assignment? • How well chosen are exemplars – how well do they illustrate the concept?	**(1-3 marks)** **Some evidence of being able to give explanations of concepts and theories. Explanations appear to be recalled, simplistic or incomplete.** Misunderstanding, illogical connections, guessing	**(4-6 marks)** **Explanations are logical. Showing comprehension and generally free from misunderstanding, but may lack depth or connections are incompletely explored.** Logical, slightly disjointed, plausible	**(7-9 marks)** **Consistently strong evidence of clear causal links in explanations generated by the candidate. Candidate uses concepts and theories confidently in explaining decisions taken and application to new situations.** Logical reasoning, thoughtful decisions, causal links, justified
		Examples of understanding expected: justification of resources in plan, correct interpretation of drawings and specifications. Suitable manufacturing processes applied. CNC code.		
		Bottom of band Candidate interpreted one or two pieces of data, documents and specification. Limited justification of a resource, manufacturing process or technique employed. **Top of band** Candidate has correctly interpreted some of the relevant drawings, data and specification. Some justification of one or more of the resources, manufacturing processes and one technique employed.	**Bottom of band** Candidate has correctly interpreted some of the relevant drawings, data and specification. Reasonable explanation of the selection and justification of three or more of the resources, different manufacturing processes and a few of the techniques employed. **Top of band** Candidate has correctly interpreted most of the relevant drawings, data and specification. Some explanation of the selection and use of most of the resources, manufacturing processes and some of the techniques employed.	**Bottom of band** Candidate has correctly interpreted all of the relevant drawings, data and specification. Good explanation of the selection and use of all of the resources, manufacturing processes and most of the techniques employed. **Top of band** Candidate has correctly interpreted all of the relevant drawings, data, and specifications. Comprehensive explanation of the selection and justification of all of the resources, manufacturing processes and all of the techniques employed.

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
30	**AO3 Application of practical/ technical skills** • How practiced/fluid does hand eye coordination and dexterity seem? • How confidently does the candidate use the breadth of practical skills open to them? • How accurately/ successfully has the candidate been able to use skills/achieve practical outcomes?	**(1-6 marks)** **Some evidence of familiarity with practical skills. Some awkwardness in implementation, may show frustration out of inability rather than lack of care.** Unable to adapt, frustrated, flaws, out of tolerance, imperfect, clumsy.	**(7-12 marks)** **Generally successful application of skills, although areas of complexity may present a challenge. Skills are not yet second nature.** Somewhat successful, some inconsistencies, fairly adept/ capable.	**(13-18 marks)** **Consistently high levels of skill and/or dexterity, showing ability to successfully make adjustments to practice; able to deal successfully with complexity.** Dextrous, fluid, comes naturally, skilled, practiced
		Examples of skills expected: selection and competent use of tools, equipment and machinery, measurement skills.		
		Bottom of band Few tools and equipment appropriately selected, a few used competently. Very limited range of skills and techniques demonstrated during the manufacturing activity. Constant problems encountered, required frequent assistance. **Top of band** Some tools and equipment appropriately selected, some used competently. A limited range of skills and techniques demonstrated during the manufacturing activity. Frequent problems encountered, some were dealt with using appropriate assistance.	**Bottom of band** Most tools and equipment appropriately selected, all used with general competence. Adequate range of skills and techniques demonstrated during the manufacturing activity. Some problems encountered, most were dealt with using appropriate assistance. **Top of band** Most tools and equipment appropriately selected. All used competently. Good range of skills and appropriate techniques demonstrated during the manufacturing activity. Some problems encountered, most were dealt with autonomously.	**Bottom of band** All tools and equipment appropriately selected. All used competently. Good range of skills and appropriate techniques demonstrated during the manufacturing activity. A few problems encountered, most were dealt with autonomously. **Top of band** All tools and equipment appropriately selected. All used competently at all times. A wide range of skills and appropriate techniques demonstrated throughout the manufacturing activity. Minor problems encountered were dealt with autonomously.

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
15	**AO4 Bringing it all together - coherence of the whole subject** • Does the candidate draw from the breadth of their knowledge and skills? • Does the candidate remember to reflect on theory when solving practical problems? • How well can the candidate work out solutions to new contexts/ problems on their own?	**(1-3 marks)** **Some evidence of consideration of theory when attempting tasks. Tends to attend to single aspects at a time without considering implication of contextual information.** Some random trial and error, new situations are challenging, expects guidance, narrow. May need prompting.	**(4-6 marks)** **Shows good application of theory to practice and new context, some inconsistencies.** Remembers to apply theory, somewhat successful at achieving fitness for purpose. Some consolidation of theory and practice	**(7-9 marks)** **Strong evidence of thorough consideration of the context and use of theory and skills to achieve fitness for purpose.** Purposeful experimentation, plausible ideas, guided by theory and experience, fit for purpose, integrated, uses whole toolkit of theory and skills.
		Examples of bringing it all together: Applying knowledge and understanding across all tasks, justifying recommendations/approaches taken, interpretation of requirements, specifications drawings and diagrams, application and understanding of various methods of measurement and tolerancing.		
		Bottom of band Frequent difficulties encountered during measuring and checking activities. All manufactured components required rework. Most components damaged during process and frequently outside tolerance. Few components were functional. **Top of band** Some difficulties encountered during measuring and checking activities. Most manufactured components required rework. Some components damaged during process or outside tolerance but most were functional.	**Bottom of band** Few difficulties encountered during measuring and checking activities. Some manufactured components required rework. Few components with damage during process but most were within tolerance and functional. Most components had good appearance. **Top of band** Most measuring and checking activities were carried out efficiently and effectively. A few manufactured components required rework. Most components were within tolerance and functional. Most components had good appearance and finish.	**Bottom of band** All measuring and checking activities were carried out efficiently and effectively. One or two manufactured components required rework. One or two components outside tolerance although all were functional. Most components had good appearance and finish. **Top of band** All measuring and checking activities were carried out efficiently and effectively. All manufactured components were completed well within tolerance and with perfect functionality, appearance and finish.

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
15	**AO5 Attending to detail/ perfecting** • Does the candidate routinely check on quality, finish etc and attend to imperfections/ omissions • How much is accuracy a result of persistent care and attention (eg measure twice cut once)? • Would you describe the candidate as a perfectionist and wholly engaged in the subject?	**(1-3 marks)** **Easily distracted or lack of checking. Insufficiently concerned by poor result; little attempt to improve. Gives up too early; focus may be on completion rather than quality of outcome.** Careless, imprecise, flawed, uncaring, unfocussed, unobservant, unmotivated.	**(4-6 marks)** **Aims for satisfactory result but may not persist beyond this. Uses feedback methods but perhaps not fully or consistently.** Variable/intermittent attention, reasonably conscientious, some imperfections, unremarkable.	**(7-9 marks)** **Alert, focussed on task. Attentive and persistently pursuing excellence. Using feedback to identify problems for correction.** Noticing, checking, persistent, perfecting, refining, accurate, focus on quality, precision, refinement, faultless, meticulous.
		Examples of attending to detail: CAD drawing, CNC code. Accuracy and precision of manufacture.		
		Bottom of band Candidate has manufactured a few products. The accuracy is low or inadequate. CAD drawing produced to a low level of accuracy. CNC code produced with several errors. **Top of band** Candidate has manufactured a few products to an adequate level of accuracy. CAD drawing produced to a low level of accuracy. CNC code produced with some errors.	**Bottom of band** Candidate has manufactured most products to an adequate level of accuracy. CAD drawing produced to a good level of accuracy. Appropriate CNC code produced. **Top of band** Candidate has manufactured most products to a good level of accuracy. CAD drawing produced to a good level of accuracy. Appropriate CNC code produced.	**Bottom of band** Candidate has manufactured all products to a good level of accuracy and precision. CAD drawing produced to a high level of accuracy. Accurate and appropriate CNC code produced. **Top of band** Candidate has manufactured all products to a high level of accuracy and precision. CAD drawing produced to a high level of accuracy. Accurate and appropriate CNC code produced.

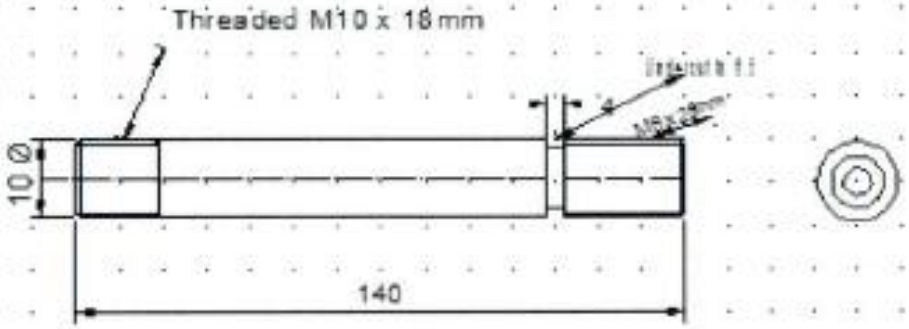
Name: Archie Ashford		Production Plan						
Figure 1		Threaded Shaft						
Stages	Method Of Procedure	Required Gear/Tools	Time Taken	Material Used	Machines Used	Justification For Methods Of Procedure And Level Of Automation	Required Set Up For Specific Machinery	Quality Control Checks
1	Measure out 150mm mild steel shaped hexagonal bar using a height gauge	height gauge	2 Mins	Mild steel	N/A	a height gauge will be a more accurate measurement than using a ruler	N/A	150mm + or - 2mm
2	place your material in a vice and using a hacksaw cut your hexagonal bar down to the 150mm line	hacksaw,vice	5 Mins	Mild steel	N/A	using a vice will be the best holding device to securly hold your work while its cut	N/A	150mm + or - 2mm
3	once your material has been cut down to size, using a file deburr the edges	File,vice	5 Mins	Mild steel	N/A	Using a file will be the easiest and quickest way of deburring the edges	N/A	135mm + or - 2mm
4	Place your mild steel bar into the lathe and make sure that the turning tool is centre height to the material (8mm)	N/A	5-10 Mins	Mild steel	Lathe	if needed use a running steady to securly hold your mild steel bar to stop it from bounding up and down	make sure that the turning tool is being used and tool is centre height to material	8mm + or - 2mm
5	using the lathe turn off 6mm at the top of the shaft so the diameter is 10mm cut this 4mm down from the top (keep Using micrometre to check diameter)	Micrometre	10 Mins	Mild steel	Lathe	using a manual micrometre to check the diameter of the bar is more accurate than using a ruler	make sure that the turning tool is being used and tool is centre height to material	10mm + or - 2mm
6	cut down 2mm from where it was previously cut down from so the diameter is now 8mm wide and 4.5mm long	Micrometre	5 Mins	Mild steel	Lathe	using a manual micrometre to check the diameter of the bar is more accurate than using a ruler	N/A	8mm + or - 2mm & 4.5mm + or - 2mm
7	move the cutting tool out back to the 16mm diameter bar after you've followed the previous step and cut in 6mm down 14mm	Micrometre	10 - 15 Mins	Mild steel	Lathe	using a manual micrometre to check the diameter of the bar is more accurate than using a ruler	N/A	14mm + or - 2mm
8	move the cutting tool back to the 16mm diameter and turn off 4mm so the diameter is now 12mm, but make sure that the 12mm diameter is 97.5mm long	Micrometre, vernier caliper	5-6 Mins	Mild steel	Lathe	But make sure that the 12mm diameter will ba mm easiest and quickest way of deburring mm long	N/A	12mm + or - 2mm & 97.5mm + or - 2mm
9	now using a m12 thread cut the external thread over the 12mm diameter of the shaft that has just been cut down using a tap wrench and a lathe	m12 thread	5 Mins	Mild steel	Lathe	using the lathe to create this external cut will be much easier than putting your work into a vice and doing it	N/A	12mm + or - 2mm
10	once the m12 thread has been cut, make sure that the bottom of the shafts diameter is 16mm still and 15mm wide	micrometre, veriner caliper	5 mins	Mild steel	Lathe	Make sure that the bottom of the shafts diameter is 16mm still will ha mm easiest and quickest way of deburring mm wide	N/A	16mm + or - 2mm

Name: Archie Ashford		Production Plan						
Figure 2		2 Pins Off						
Stages	Method Of Procedure	Required Gear/Tools	Time Taken	Material Used	Machines Used	Justification For Methods Of Procedure And Level Of Automation	Required Set Up For Specific Machinery	Quality Control Checks
1	Create a design for the screw on lathe CAM designer	N/A	15 Mins	Mild Steel	N/A	Using Lathe CAM designer will help me get the correct measurements for my screw	N/A	N/A
2	create the code for the CNC Machine	N/A	1 Hr	Mild Steel	CNC Machine	The CNC Machine needs a code so it can run because it follows the codes instructions to cut the material	N/A	N/A
3	put mild steel bar into CNC Machine	N/A	2 Mins	Mild Steel	CNC Machine	The CNC Machine is going to cut my material so I need to place the material in the CNC machine	N/A	N/A
4	Run the created CNC program on the computer	N/A	35 Mins	Mild Steel	CNC Machine	using the CNC will cut my material to the extact measurements I put in the code	N/A	N/A
5	once the program has finished cutting the mild steel bar take it out of the machine and measure the thread that it is 140mm	Vernier Caliper	5 Mins	Mild Steel	CNC Machine	make sure that the Screw measures at 140mm	N/A	140mm + or - 2mm

+	Production Plan							
Figure 3	Top Screw Plate							
Stages	Method Of Procedure	Required Gear/Tools	Time Taken	Material Used	Machines Used	Justification For Methods Of Procedure And Level Of Automation	Required Set Up For Specific Machinery	Quality Control Checks
1	Firstly Get your Square shaped mild steel bar and mark out 105mm and 100mm with a height gauge	height gauge	3 Mins	Mild Steel	N/A	using a height gauge will be a clearer and more accurate measurement	N/A	105mm + or - 2mm & 100mm + or - 2mm
2	Sencue the piece of marked material into a Vice, Using a hacksaw cut the marked line on your material	Hacksaw, Vice	5 Mins	Mild Steel	N/A	using a vice would be the best way to secure your work when preparing to cut it	N/A	105mm + or - 2mm
3	Once the mild steel bar has been cut,use a file to deburr the sharp edges and measure with a veriner to check the size	File, Vernier Caliper	10 Mins	Mild Steel	N/A	using a veriner to check size would be much more accurate than a ruler	N/A	100mm + or - 2mm
4	if the block of mild steel is more than 100mm use the milling machine to mill it down to 100mm,this will also make both sides smooth and straight cut	End Mill	10 Mins	Mild Steel	Milling Machine	Using the milling machine to cut down the block to 100mm is much easier than using the file	Make sure that a End Mill Cutting tool is placed in the chuck	100mm + or - 2mm
5	Using a height gauge mark out halfway which is 50mm then mark out 10 mm width from 15mm from each side	height gauge	5 Mins	Mild Steel	N/A	using a height gauge will be a clearer and more accurate measurement	N/A	50mm + or - 2mm, 10mm + or - 2mm & 15mm + or - 2mm
6	Now using a centre punch and hammer mark out the centre of both holes which come in 15mm from each side and centre punch the 50mm centre hole	Centre Punch, Hammer	5 Mins	Mild Steel	N/A	using a centre punch will mark out where abouts you should drill	N/A	15mm + or - 2mm, 50mm + or - 2mm
7	using the machine vice hold your work onto the milling machine table, using a centre drill pre drill the 50 mm hole then using a 12mm drill bit drill the centre hole all the way through, then drill the other holes which come in 15mm from both sides and drill them hole with a 10mm drill bit	Machine Vice, 10mm Drill Bit, centre drill	10 Mins	Mild Steel	Milling Machine	using a centre drl will pre drill a hole for you to get a cleaner cut when using a big drill bit straight away	make sure that you centre drill all three holes before changing drill bit to save time	10mm + or - 2mm, 12mm + or - 2mm & 50mm + or - 2mm
8	after securing your work into a vice using a m12 thread create the internal thread inside the 12mm centre hole	m12 thread, vice	5 Mins	Mild Steel	N/A	using a vice would be the best way to secure your work when cutting a internal thread	N/A	12mm + or - 2mm

Name: Archie Ashford		Production Plan						
Figure 8		Bottom Jaw						
Stages	Method Of Procedure	Required Gear/Tools	Time Taken	Material Used	Machines Used	Justification For Methods Of Procedure And Level Of Automation	Required Set Up For Specific Machinery	Quality Control Checks
1	Firstly Cut your Stainless steel bar and mark out 105mm and 100m with the height gauge	height gauge	5 Mins	Mild Steel	N/A	Using the height gauge to mark the measurements will be more accurate than a ruler	N/A	105mm +or - 2mm & 100mm +or - 1mm
2	Secure the piece of marked material into a Vice, Using a hacksaw cut the marked line on your material	Hacksaw, Vice	5 Mins	Mild Steel	N/A	Using a vice will be the best way to securely hold your work in place to cut the marked line	N/A	105mm +or - 2mm
3	Once the mild steel has been cut, use a file to deburr the sharp edges and manually with a ruler to check the size	File, Vernier Calliper	10 Mins	Mild Steel	N/A	Using a file will be the quickest way of deburring the edges while your work is secured make a nice	N/A	100mm +or - 2mm
4	If the block of mild steel is more than 100mm use the milling machine to mill it down to 100mm, this will also make both sides smooth and straight cut	End Mill	10 Mins	Mild Steel	Milling Machine	Using the height gauge to mark the measurements will be more accurate than a ruler	Make sure that a End Mill Cutting tool is placed in the Chuck	100mm +or - 2mm
5	Using the height gauge mark out halfway which is 52mm then mark out 15mm width from 25mm from each side	height gauge	5 Mins	Mild Steel	N/A	Using the height gauge to mark the measurements will be more accurate than a ruler	N/A	52mm + or - 2mm, 15mm + or - 2mm & 25mm + or - 2mm
6	Now using a centre punch and hammer mark out the centre of both holes which come in 15mm from each side	Centre Punch, Hammer	5 Mins	Mild Steel	N/A	Using a centre punch will mark out where exactly you should drill	N/A	15mm + or - 2mm
7	Using the machine vice hold your work into the milling machine table, using a centre drill pre-drill a hole then using a 10mm vertical drill the left side hole 25mm deep and drill the right side all the way through	Machine Vice, 10mm Drill Bit, Centre drill	10 Mins	Mild Steel	Milling Machine	Using a centre drill will pre drill a hole for you to get a cleaner cut when using a big drill bit straight away	Change the End Mill Cutting tool in the mill chuck to a centre drill then change to a 10mm drill bit	10mm + or - 2mm, 25mm + or - 2mm
8	Mark out a 10mm wide line and 50mm long and centre punch the centre where the two lines connect	height gauge,centre punch & hammer	10 Mins	Mild Steel	N/A	Using the height gauge to mark the measurements will be more accurate than a ruler	N/A	10mm + or - 2mm, 50mm + or - 2mm
9	The drill bit on the milling machine will have to be changed to a countersink tool so that the 90 degree angle can be cut on the centre punched spot	Countersink Tool	10 Mins	M10 Steel	Milling Machine	Using the countersink tool on the milling machine will be the easiest to cut out a 90 degree angle in the centre of the 10mm	Change the 10mm drill bit in the mill chuck to a countersink tool	90 Degrees + or - 2 Degrees
10	After you have created the 90 degree cut in the centre of the material, clamp your work into a vice and using a M10 internal thread cut a thread inside the 25mm deep 15mm hole	M10 Thread,Vice	5 Mins	Mild Steel	N/A	Using a vice will be the best way to securely hold your work in place to cut the internal thread	N/A	25mm + or - 2mm

Name: Archie Ashford		Production Plan						
Figure 5		Top Sliding Jaw						
Stages	**Method Of Procedure**	**Required Gear/Tools**	**Time Taken**	**Material Used**	**Machines Used**	**Justification For Methods Of Procedure And Level Of Automation**	**Required Set Up For Specific Machinery**	**Quality Control Checks**
1	Using a height gauge mark out 105mm of mild steel square bar	Height Gauge	2 Mins	Mild steel	N/A	Using a height gauge will give a more accurate measurement than a ruler	N/A	105mm + or - 2mm
2	place material in vice and use hacksaw to cut down the size marked	Hacksaw, Vice	5 Mins	Mild steel	N/A	using a vice to hold your work secure while you cut it with a hacksaw	N/A	100mm + or - 2mm
3	using a file and vice deburr the edges	File,vice	3 Mins	Mild steel	N/A	Using a vice to hold your work secure while you deburr the edges with a file	N/A	100mm + or - 2mm
4	Using the height gauge mark out the centre wide 12.5 mm and 50mm long	Height Gauge	3 Mins	Mild steel	N/A	using the height gauge will be much more accurate than a ruler	N/A	50mm + or - 2mm
5	Mark out 20mm up and 25mm in from the centre line that you just marked. (Do this on both sides)	Height Gauge	10 Mins	Mild steel	N/A	using the height gauge will be much more accurate than a ruler	N/A	20mm + or - 2mm, 25mm + or - 2mm
6	using the milling machine place your work in the machine vice and mill out the area that was marked on both sides of the block of material	Machine Vice, Milling Machine	15 Mins	Mild steel	Milling Machine	using the milling machine will be much quicker than manual tools and will create a cleaner cut	make sure that the end mill tool is being used to make these cuts	20mm + or - 2mm, 25mm + or - 2mm
7	Place work into vice and deburr the edges using a file, measuring 11.5 mm and mark 15mm in using a height gauge (Do this on both sides which you just cut)	Vice, file, Height gauge	5 Mins	Mild steel	N/A	using a vice to hold your work secure while you deburr the edges with a file, using the height gauge will be much more accurate than a ruler	N/A	12.5mm + or - 2mm, 15mm + or - 2mm
8	using a height gauge mark 50mm across (halfway) and 15mm up and join the lines together to find the centre	Vice,File,Height gauge	2 Mins	Mild steel	N/A	using the height gauge will be much more accurate than a ruler	N/A	15mm + or - 2mm, 50mm + or - 2mm
9	Using a centre punch and hammer mark the center of the areas you just marked	Centre punch,hammer	1 Min	Mild steel	N/A	Use the centre punch and hammer to create a small mark which shows where to drill	N/A	15mm + or - 2mm, 50mm + or - 2mm
10	Using a 5m drill create a hole and a M4 thread and thread it for a M4 Grub screw on the 50mm measurement mark and use a 12mm drill bit for both other marked holes	Tap Wrench	10 Mins	Mild steel	Milling Machine	use the tap wrench to create a internal m4 thread	Use a 5mm drill bit, 12mm drill bit and use a tap wrench to tap the 5mm hole for the M4 grub screw	5mm + or - 2mm, 12mm + or - 2mm
11	Using a countersink tool on the milling machine create a 60 degree cut in the centre of the material (50mm across)	Countersink Tool	5 Mins	Mild steel	Milling Machine	use the countersink tool on the milling machine because it is	Make sure that the countersink tool is being used on the milling machine	60 degrees + or - 2mm, 50mm + or - 2mm



Name: Archie Ashford	Date:	MATERIAL: mild steel	No OFF: 10 FF
SCALE: 1 : 1	PROJECTION		DRAWING NUMBER: ROTATING BUSH
TITLE: 2 Pins Off		GREENACRE SCHOOL	

Computer Numeric Control (CNC) Programme For M8 Screw

(Novaturn (Metric))

(Post fanuc1:1.8 2nd February 2000)

```
N1G21
[BILLET X10 Z45]
N2G98
N3G28U0W0
N4M6T0101
N5G97M3S3500
N6G0X12Z0
N7G1X0F60
N8G0Z2
N9X12
N10X10
N11X12
N12X10
N13G1Z-27.63
N14X12
N15G0Z2
N16X9
N17G1Z-27.63
N18X11
N19G0Z2
N20X8
N21G1Z-0.16
N22X10
N23G0Z2
N24X7
N25G1Z-0.16
N26X9
N27X12
N28G0Z2
N29X0
N30G1Z0
N31X6
N32X7.9Z-1
N33Z-28
N34X10
N35Z-40
N36X12
N37G0Z2
N38M5
N39G28U0W0
```

Test Record Sheet For Clamp

Feature	Specified Dimension	Tolerance	Actual Dimension	Comment
Figure 2				
Threaded Shaft	120mm	0.2 + or -	119.98mm	Passed Met With Criteria
	15mm	0.2 + or -	15mm	Passed Met With Criteria
	14mm	0.2 + or -	12mm	Passed Met With Criteria
	4mm	0.2 + or -	4mm	Passed Met With Criteria
	4.5mm	0.2 + or -	4.3mm	Passed Met With Criteria
	M12	0.2 + or -	M12	Passed Met With Criteria
	10mm	0.2 + or -	9.98mm	Passed Met With Criteria
Figure 3				
2 Pins	140	2 + or -	138mm	Passed Met With Criteria
	28	0.4 + or -	27.6mm	Passed Met With Criteria
	M8 X 28	M8 Thread	M8 x 28mm	Passed Met With Criteria
	4 x 7.5dia	0.4 + or -	4 x 7.3	Passed Met With Criteria
Figure 4				
Top Screw Plate				
	100mm	2 + or -	98.43mm	Passed Met With Criteria
	50	2 + or -	48mm	Passed Met With Criteria
	15	2 + or -		Passed Met With Criteria
	M12	M12 Thread	M12	Passed Met With Criteria
	8.2mm	0.4 + or -	8.2mm	
Figure 5				
Bottom Jaw				
	100	2 + or -	98mm	Passed Met With Criteria
	30	2 + or -	29	Passed Met With Criteria
	120 Degree	2 degrees + or -	118 degrees	Passed Met With Criteria
	15	2 + or -	15	Passed Met With Criteria
	m10 x 20	M10 Thread	M10 x 20mm	Passed Met With Criteria
Figure 6				
Top Sliding Jaw	100	2 + or -	98mm	Passed Met With Criteria
	15	2 + or -	15.45mm	Passed Met With Criteria
	50	2 + or -	50.50mm	Passed Met With Criteria
	25	2 + or -	23mm	Passed Met With Criteria
	20	2 + or -	18mm	Passed Met With Criteria
	15	2 + or -	15.25mm	Passed Met With Criteria
	M4	M4 Thread	M4	Passed Met With Criteria
	120 degree	2 degrees + or -	120 degrees	Passed Met With Criteria
	10.2mm	0.4 + or -	10.5mm	Passed Met With Criteria
	10.2mm x2	0.4 + or -	10.5mm	Passed Met With Criteria

Photographic Evidence Of Me Making Of The Synoptic Clamp

Photographic Evidence Of Me Making Of The Synoptic Clamp

Photographic Evidence Of Me Making Of The Synoptic Clamp

STANDARD G CODE CHART FOR LATHES

(G-Codes vary from machine to machine)
G00 positioning (rapid)
G01 linear interpolation (feed)
G02 circular interpolation CW
G03 circular interpolation CCW
G04 dwell
G07 hypothetical axis interpolation (sine curve)
G09 exact stop
G10 offset value setting
G20 G70 inch data input
G21 G71 metric data input
G22 stored stroke limit ON
G23 stored stroke limit OFF
G27 reference point return check
G28 return to reference point
G29 return from reference point
G30 return to 2nd, 3rd & 4th reference point
G31 skip cutting
G32 G33 thread cutting
G34 variable thread cutting
G36 automatic tool compensation X
G37 automatic tool compensation Y
G40 tool nose radius compensation cancel
G41 tool nose radius compensation left
G42 tool nose radius compensation right
G50 G92 programming of absolute zero point maximum spindle speed setting
G65 user macro simple call
G66 user macro modal call
G67 user macro modal call cancellation
G68 mirror image for double turrets ON
G69 mirror image for double turrets OFF
G70 G72 finishing cycle
G71 G73 stock removal in turning
G72 G74 stock removal in facing
G73 G75 pattern repeating
G74 G76 peck drilling in Z axis
G75 G77 grooving in X axis
G76 G78 thread cutting cycle
G90 G77 G20 cutting cycle A
G92 G78 G21 thread cutting cycle
G94 G79 G24 cutting cycle B
G96 constant surface speed control
G97 constant surface speed control cancel
G98 G94 per minute feed
G99 G95 G95 per revolution feed
G90 absolute programming
G91 incremental programming

STANDARD M-CODES

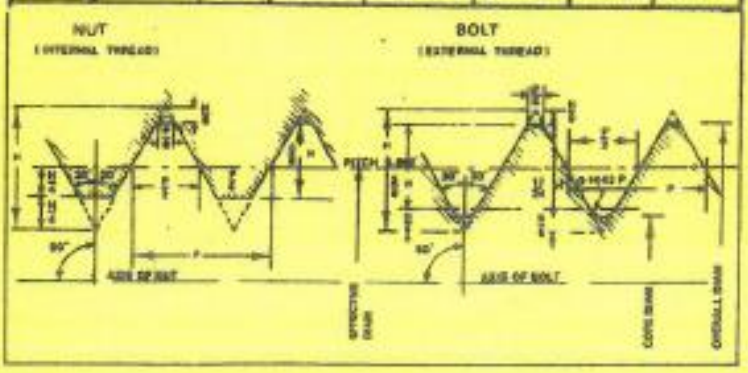
(M-Codes vary from machine to machine)
M00 program stop
M01 optional stop
M02 end of program (no rewind)
M03 spindle CW
M04 spindle CCW
M05 spindle stop
M06 tool change
M07 mist coolant ON
M08 flood coolant ON
M09 flood coolant OFF
M19 spindle orientation ON
M30 end program (rewind stop)
M98 call sub-program
M99 end sub-program

ZEUS PRECISION
DATA BOOK.

I.S.O. METRIC COARSE THREADS

NOTE:—All dimensions in mm.'s

O.Dia.	Core	Pitch	Depth	Flat	Effec.	Tapp'g Drill	Cl'ance Drill
1.6	1.1706	0.35	0.2147	0.04375	1.373	1.25	1.65
1.8	1.3706	0.35	0.2147	0.04375	1.573	1.45	1.85
2.0	1.5092	0.40	0.2454	0.05000	1.740	1.60	2.05
2.2	1.6480	0.45	0.2760	0.05625	1.908	1.75	2.25
2.5	1.9480	0.45	0.2760	0.05625	2.208	2.05	2.60
3.0	2.3866	0.50	0.3067	0.06250	2.675	2.50	3.10
3.5	2.7638	0.60	0.3681	0.07500	3.110	2.90	3.60
4.0	3.1412	0.70	0.4294	0.08750	3.545	3.30	4.10
4.5	3.5798	0.75	0.4601	0.09375	4.013	3.80	4.60
5.0	4.0184	0.80	0.4908	0.10000	4.480	4.20	5.10
6.0	4.7732	1.00	0.6134	0.12500	5.350	5.00	6.10
7.0	5.7732	1.00	0.6134	0.12500	6.350	6.00	7.20
8.0	6.4664	1.25	0.7668	0.15625	7.188	6.80	8.20
10.0	8.1596	1.50	0.9202	0.18750	9.026	8.50	10.20
12.0	9.8530	1.75	1.0735	0.21875	10.863	10.20	12.20
14.0	11.5462	2.00	1.2269	0.25000	12.701	12.00	14.25
16.0	13.5462	2.00	1.2269	0.25000	14.701	14.00	16.25
18.0	14.9328	2.50	1.5336	0.31250	16.376	15.50	18.25
20.0	16.9328	2.50	1.5336	0.31250	18.376	17.50	20.25
22.0	18.9328	2.50	1.5336	0.31250	20.376	19.50	22.25
24.0	20.3194	3.00	1.8403	0.37500	22.051	21.00	24.25
27.0	23.3194	3.00	1.8403	0.37500	25.051	24.00	27.25
30.0	25.7060	3.50	2.1470	0.43750	27.727	26.50	30.50
33.0	28.7060	3.50	2.1470	0.43750	30.727	29.50	33.50
36.0	31.0924	4.00	2.4538	0.50000	33.402	32.00	36.50
39.0	34.0924	4.00	2.4538	0.50000	36.402	35.00	39.50
42.0	36.4790	4.50	2.7605	0.56250	39.077	37.50	42.50
45.0	39.4790	4.50	2.7605	0.56250	42.077	40.50	45.50
48.0	41.8646	5.00	3.0672	0.62500	44.752	43.00	48.75
52.0	45.8646	5.00	3.0672	0.62500	48.752	47.00	52.75
56.0	49.2522	5.50	3.3739	0.68750	52.428	50.50	56.75
60.0	53.2522	5.50	3.3739	0.68750	56.428	54.50	60.75
64.0	56.6388	6.00	3.6806	0.75000	60.103	58.00	64.75
68.0	60.6388	6.00	3.6806	0.75000	64.103	62.00	68.75



Declaration of Authenticity

Candidate name Ima Candidate | Candidate number 123456

Centre name Bigsville Technocal College | Centre number 654321

Candidate:

I confirm that all work submitted is my own, and that I have acknowledged all sources I have used.

Candidate signature *Ima Candidate* Date 14/02/18

Tutor:

I confirm that all work was conducted under conditions designed to assure the authenticity of the candidate's work, and am satisfied that, to the best of my knowledge, the work produced is solely that of the candidate.

Tutor signature *Ima Gudtutor* Date 14/02/18

Has the candidate received any additional support in the production of this work?

Tick Yes ☐ No x

If the answer is yes, give details below and on a separate sheet if necessary.

Note:

Where the candidate and/or tutor is unable to, or does not confirm authenticity through signing this declaration form, the work will not be accepted at moderation and a mark of zero will be given. If any question of authenticity arises, the tutor may be contacted for justification of authentication.

Practical Observation Form

Technical Qualifications

Candidate name:	**Candidate number:**
Ima Candidate	123456
Centre number:	**Assessment ID**
654321	1145-21

Please complete the table below with reference to the relevant Assessment Objectives, as indicated in the Assessment Packs. Do not allocate marks at this stage.

Assessment Objective (AO) - refer to the marking grid for additional guidance.	**Notes –** detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different quality of performances and to facilitate accurate allocation of marks once all evidence has been submitted.
AO1 Describe how well the candidate shows **recall** of knowledge e.g. stating facts without explanation / simple descriptions of what they are carrying out / showing aspects of straightforward knowledge through logical sequencing and application of skill etc.	Candidate has identified a few pieces of required and relevant data, documents to help inform with his production plans. A fair amount of information on identified manufacturing processes are evident and available. Recall of these have been fairly accurate and shows reasonable understanding. Candidate has identified some resources including tools & equipment.

Assessment Objective (AO) - refer to the marking grid for additional guidance.	**Notes –** detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different quality of performances and to facilitate accurate allocation of marks once all evidence has been submitted.
AO2 Describe how well the candidate shows **understanding** when carrying out practical tasks e.g. their explanation of why they are completing a process or how they may change their course of action / are they able to justify their actions etc.	Candidate has correctly intrepeted some of the relevant drawings, data and the specification. There is some evidence of being able to give explanations of concepts + theories. Some justification of some of the resources, manufacturing processes and techniques employed, however explanations appear to be simplistic and incomplete.
AO3 Describe how well the candidate demonstrated their **practical skills**. e.g. how practiced/fluid is hand eye coordination and dexterity / how confident are they / how accurate or 'polished' is the outcome / safe working etc.	Candidate has mostly selected tools and equipment correctly and appropiatly. Most tools have been used with an adequate degree of competency throughout the Practical element of this synoptic. Areas of complexity have presented a challenge however have been completed somewhat successfully. A good range of techniques have been demonstrated with some problems encountered. With these problems the candidate has dealt with them autonomously and accurately.

Assessment Objective (AO) - refer to the marking grid for additional guidance.	**Notes –** detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different quality of performances and to facilitate accurate allocation of marks once all evidence has been submitted.
AO4 Describe how well the candidate **brings it all together** – e.g. how **coherent** are their actions / how well do they draw from the breadth of their knowledge and skills / reflection on theory when solving practical problems / How well can they work out solutions to new contexts/ problems on their own / time management etc.	Candidate has shown some difficulties encountered during the measuring and checking activities. He has shown a small amount of difficulty setting up the measuring apparatus, however once set up he was able to use it effectively. Some of the manufactured products required reworking to make the product work correctly. Most products were within tolerance once reworked. Most have a good appearance.
AO5 Describe how well the candidate **attended to detail** e.g. professionalism / perfecting / accuracy / checking / taking care / methodical working etc.	Candidate has manufactured most products to an adequate level of accuracy. Candidate has shown that he can become easily distracted and has shown a tendency to give up easily. He has focused on the completion of the task rather than the overall quality. CAD drawing produced to a degree of accuracy along with appropriate CNC code.

Tutor / marker signature:	**Date:**
Ima Gudtutor	

Candidate Record Form

Candidate Name: **Assessment ID:**

Candidate Number: **Centre Number:**

Marker Notes – Please always refer to the relevant marking grid for guidance on allocating marks and make notes which describe the quality of the evidence and justification of marks.

AO1 – Recall - Breadth, depth, accuracy															
25%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AO1 Mark: 6	Notes/Comments: [redacted] has shown a fair amount of knowledge and understanding however has shown frustration at times getting it put down on paper. He has identified tools & processes and verbally made reference to Hazards and PPE. However this is not evident in Printed work.														

AO2 – Understanding - Security of concepts, causal links									
15%	1	2	3	4	5	6	7	8	9
AO2 Mark: 3	Notes/Comments: Selection of resources evident in production plan however it is not detailed and justified to a high standard. Intropuets drawings to Produce own CAD Drawing however this was strained and caused significant frustration.								

AO3 - Practical skill - Dexterity, fluidity, confidence, ease of application																		
30%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AO3 Mark: 8	Notes/Comments: Mostly selected correct tools and equipment and has shown mostly confidence in using these. Abides by rules of D+T Room however leaves working area cluttered with tools lying around. Test carried out on screws + threads and also dimensions.																	

AO4 – Bringing it together - use of knowledge to apply skills in new context									
15%	1	2	3	4	5	6	7	8	9
9AO4 Mark: 5	Notes/Comments: limited to fair justification provided for reasons for tool + machinery selection. Fairly adept at measurement as shows good knowledge and understanding of measurement apparatus.								

AO5 - Attending to detail / perfecting - Repeated checking, perfecting, noticing, engaged									
15%	1	2	3	4	5	6	7	8	9
AO5 Mark: 4	Notes/Comments: fair attempt at clamp manufacture. Some components are within tolerance however others are not meaning that it has an alligned the clamp meaning that it does not function properly.								

Tutor/Marker signature:

Section 5 Principal Moderator's guidance, hints and tips.

This practise marking material has been produced to be used for standardisation activities and for centre guidance in the early years of the qualification. The marks allocated to each learner are in accordance with the Principal Moderator marks and show the standard set for this qualification.

To make holistic judgments, it is necessary to ensure that all tasks are completed and submitted prior to assigning any final marks. Practical tasks are not marked independently of written submissions so ensure that all tasks have been completed before assigning any marks.

When judging ephemeral performances / practical skills, centres must ensure that the evidence is in a format visible to the marker/moderator and gives sufficient qualitative detail to aid moderation. Observers and markers should ensure their notes are comprehensive, employing key words written in the marking grids and describing how, where or why the work is good or better. Along with this they should ensure that any verbal questions are documented and that weaknesses / mistakes as well as strengths / exemplary practice are noted on the PO form. These notes will enable the centre marker and the moderator get a feel for the practical skills shown by each individual on the synoptic assessment day/s and will assist in allocation of marks and rank ordering.