



National 5 Practical Metalworking

Course code:	C861 75
Course assessment code:	X861 75
SCQF:	level 5 (24 SCQF credit points)
Valid from:	session 2017–18

The course specification provides detailed information about the course and course assessment to ensure consistent and transparent assessment year on year. It describes the structure of the course and the course assessment in terms of the skills, knowledge and understanding that are assessed.

This document is for teachers and lecturers and contains all the mandatory information you need to deliver the course.

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Course overview

The course consists of 24 SCQF credit points which includes time for preparation for course assessment. The notional length of time for a candidate to complete the course is 160 hours.

The course assessment has two components.

Component	Marks	Scaled mark	Duration
Component 1: question paper	60	30	1 hour
Component 2: practical activity	70	70	See course assessment section.

Recommended entry	Progression
<p>Entry to this course is at the discretion of the centre.</p> <p>Candidates should have achieved the fourth curriculum level or the National 4 Practical Metalworking course or equivalent qualifications and/or experience prior to starting this course.</p>	<ul style="list-style-type: none">◆ other qualifications in practical technologies or related areas◆ further study, employment and/or training

Conditions of award

The grade awarded is based on the total marks achieved across all course assessment components.

Course rationale

National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

Every course provides opportunities for candidates to develop breadth, challenge and application. The focus and balance of assessment is tailored to each subject area.

The National 5 Practical Metalworking course provides a broad introduction to practical metalworking. It is largely workshop-based, combining elements of theory and practical metalworking techniques.

Candidates develop practical psychomotor skills (manual dexterity and control) in a universally popular practical craft. They are introduced to safe working practices and become proactive in matters of health and safety. They learn how to use a range of tools, equipment and materials safely and correctly.

Candidates develop skills in reading drawings and diagrams, measuring and marking out, cutting, shaping and finishing materials. They learn how to work effectively alongside others in a shared workshop environment. Course activities also provide opportunities to build self-confidence and to enhance skills in numeracy, thinking, planning, organising and communicating — these are all valuable skills for learning, for life and for work.

The course encourages candidates to become responsible and creative in their use of technologies and to develop attributes such as flexibility, enthusiasm, perseverance, reliability and confidence.

Purpose and aims

The National 5 Practical Metalworking course provides opportunities for candidates to gain a range of theoretical and practical metalworking skills relating to tools, equipment, processes and materials. They also develop skills in reading and interpreting working drawings and related documents as well as an understanding of health and safety.

The course is practical, exploratory and experiential in nature. It engages candidates with technologies, allowing them to consider the impact that practical technologies have on our environment and society.

Through this, they develop skills, knowledge and understanding of:

- ◆ metalworking techniques
- ◆ measuring and marking out metal sections and sheet materials
- ◆ safe working practices in workshop environments
- ◆ practical creativity and problem-solving skills
- ◆ sustainability issues in a practical metalworking context

Who is this course for?

This course is a broad-based qualification, suitable for learners with an interest in practical technologies. It is largely learner-centred, includes practical and experiential learning opportunities and is suitable for those wanting to progress onto further levels of study or a related career.

Course content

This course develops skills in three main areas. Each area provides opportunities for candidates to understand safe working practices, sustainability issues, and good practice in recycling within a workshop environment. Each area of study covers a different set of metalworking skills. All areas include skills and associated knowledge in measuring, marking out, cutting and joining techniques.

The areas of study are:

Bench skills

Candidates develop skills, knowledge and understanding in the use of metalworking hand tools, bench-fitting work, routine sheet-metal work, measuring and marking out, involving complex features. Candidates develop their ability to read and use drawings and diagrams depicting both familiar and unfamiliar metalwork tasks.

Machine processes

Candidates develop skills, knowledge and understanding in the use of metalworking machines, equipment, related processes, materials, measuring and marking out, involving complex features.

Fabrication and thermal joining

Candidates develop skills, knowledge and understanding in fabrication, forming and joining of metalwork components with some complex features. Candidates develop skills in thermal joining techniques and in measuring and marking out.

Skills, knowledge and understanding

Skills, knowledge and understanding for the course

The following provides a broad overview of the subject skills, knowledge and understanding developed in the course:

- ◆ using a range of metalworking tools, equipment and materials safely and correctly for metalworking tasks with some complex features
- ◆ adjusting tools where necessary, following safe practices
- ◆ reading and interpreting drawings and diagrams in familiar and some unfamiliar contexts
- ◆ measuring and marking out metal sections and sheet materials in preparation for cutting and forming tasks with some complex features
- ◆ practical creativity in the context of familiar metalworking tasks with some complex features
- ◆ following, with autonomy, given stages of a practical problem-solving approach to metalworking tasks

- ◆ applying knowledge and understanding of safe working practices in a workshop environment
- ◆ knowledge and understanding of the properties and uses of a range of metalworking materials
- ◆ knowledge and understanding of sustainability issues in a practical metalworking context

Skills, knowledge and understanding for the course assessment

The following provides details of skills, knowledge and understanding sampled in the course assessment:

Practical activity		Question paper	
Skills	Candidates are required to demonstrate the ability to:	Knowledge and Understanding	Candidates are required to demonstrate a knowledge and understanding of:
Measuring and marking out	Use measuring and marking out tools from the list below: <ul style="list-style-type: none"> ◆ scribe and scribing block ◆ steel rule ◆ combination set ◆ engineer's square ◆ centre finder ◆ spring dividers ◆ calipers: oddleg, inside, outside ◆ micrometer: analogue or digital ◆ Vernier calipers: analogue or digital ◆ centre punch ◆ witness marks ◆ surface table ◆ angle block ◆ v-block 	Measuring and marking out	A knowledge and understanding of the use of the tools and equipment listed below: <ul style="list-style-type: none"> ◆ scribe and scribing block ◆ steel rule ◆ combination set ◆ engineer's square ◆ centre finder ◆ spring dividers ◆ calipers: oddleg, inside, outside ◆ micrometer: analogue and digital ◆ Vernier calipers: analogue and digital ◆ centre punch ◆ witness marks ◆ surface table ◆ angle block ◆ v-block ◆ engineer's blue ◆ units of measurement

			<ul style="list-style-type: none"> ◆ datum lines ◆ functional dimensions ◆ the need to make allowances for expansion, bending, stretching, forming, trimming, welding, brazing and soldering
Reading and interpreting drawings and documents	<p>Read and extract relevant information from:</p> <ul style="list-style-type: none"> ◆ working drawings, pictorial drawings, diagrams, cutting lists 	Reading and interpreting drawings and documents	<ul style="list-style-type: none"> ◆ working drawings, pictorial drawings, diagrams, cutting lists ◆ orthographic projection ◆ scale ◆ basic drawing conventions: line types — outlines, centre lines, fold lines, hidden detail and dimension lines ◆ reading and extracting information from working drawings: linear, radial, angular and diametric dimensions
Materials	<p>Work safely with metalworking materials.</p>	Materials	<p>Properties of the metalworking materials listed below:</p> <ul style="list-style-type: none"> ◆ ferrous metals: steel, high carbon steel, iron ◆ non-ferrous metals: aluminium, copper, nickel ◆ alloys: bronze, brass, stainless steel ◆ common sections: square bar, round bar, hexagonal bar, angle iron, tube ◆ sheet materials: tin plate, copper, brass, steel, aluminium
Bench work	<p>Safely use tools listed below:</p> <ul style="list-style-type: none"> ◆ engineer's vice ◆ hammers ◆ cold chisels 	Bench work	<p>The safe use of the following bench tools and their component parts.</p> <ul style="list-style-type: none"> ◆ engineer's vice ◆ ball-pein hammer

	<ul style="list-style-type: none"> ◆ files ◆ saws ◆ taps, tap wrench ◆ dies, die stock ◆ rivet set and snap 		<ul style="list-style-type: none"> ◆ cold chisels ◆ file types: flat, square, round, needle and 3 square ◆ file parts: tang, safe-edge, handle, ferrule ◆ file cut: smooth, 2nd cut and rough ◆ filing methods: cross filing and draw filing ◆ saws: hacksaw and junior hacksaw ◆ taps: taper, intermediate and plug, tap wrench, drill sizes for tapping ◆ dies: adjustment of split die, die stock ◆ rivet set and snap
Sheet metal tools and machines	<p>Safely use the machines and tools listed below:</p> <ul style="list-style-type: none"> ◆ bending/folding equipment ◆ notchers ◆ guillotine ◆ hide or rubber mallets ◆ tin snips ◆ pop riveter ◆ spot welder ◆ formers and jigs (as appropriate) 	Sheet metal tools and machines	<p>The safe use of tools, machines and equipment used in sheet metalwork listed below:</p> <ul style="list-style-type: none"> ◆ folding bars ◆ folding machine ◆ notchers ◆ guillotine ◆ hide and rubber mallets ◆ tin snips (straight, curved, right and left hand) ◆ pop riveter ◆ spot welder

Machine processes	Carry out processes listed below: <ul style="list-style-type: none"> ◆ centre lathe: parallel turning, taper turning (using a compound slide), facing, chamfering, centre drilling and drilling generally, knurling, parting off, use of a 4-jaw chuck (if appropriate) ◆ pedestal/pillar drill for drilling and countersinking 	Machine Processes	The actions carried out on the machines/processes listed below: <ul style="list-style-type: none"> ◆ pedestal/pillar drill: drilling and countersinking ◆ bench grinders ◆ centre lathe processes: facing off, parallel turning, taper turning, chamfering, drilling and use of compound slide ◆ milling machines: vertical, horizontal and CNC ◆ industrial cutting processes: laser and plasma cutters
Machine tools	Use machine tools listed below: <ul style="list-style-type: none"> ◆ lathe cutting tools ◆ knurling tool ◆ parting tool ◆ 3-jaw chuck, 4-jaw chuck, Jacob's chuck ◆ chuck keys ◆ revolving centres ◆ machine vices Use appropriate holding devices.	Machine tools	The safe use of the equipment and machinery parts listed below: <ul style="list-style-type: none"> ◆ parts of centre lathe: headstock, tailstock, tool post, compound slide, cross slide and saddle ◆ lathe cutting tools: left-hand knife tool, right-hand knife tool ◆ knurling tool ◆ parting tool ◆ 3-jaw chuck, 4-jaw chuck, Jacob's chuck ◆ chuck keys ◆ revolving centre ◆ machine vice

Finishing	Carry out an appropriate preparation to a metal surface, which would allow a finish to be applied.	Finishing	The finishing processes listed below: <ul style="list-style-type: none"> ◆ planishing ◆ polishing ◆ bluing ◆ machine finishing (ground, milled) ◆ preparation and application of paint and powder-dip coating
Care and maintenance of tools and machinery, and safe working practices	Complete a log book detailing evidence of good and safe working practices covering the following: <ul style="list-style-type: none"> ◆ care and maintenance of tools and equipment ◆ reporting faults and fault reporting systems ◆ general condition before, during and after use ◆ position and condition of guards ◆ position and security of cutting tools on machine tools ◆ use of personal protective equipment 	Safe working practices	Good practices and safe systems for general workshop and individual activities as appropriate. Personal protective equipment: apron, gloves, safety goggles, safety specs, visors, welding masks.

Fabrication and thermal joining	Use processes listed below: <ul style="list-style-type: none"> ◆ hot-forming techniques: twisting, drawing down and flattening ◆ hot-bending techniques: metal bar bending and metal strip bending ◆ thermal joining techniques: welding, soldering or brazing ◆ mechanical fixing techniques: riveting, screw-fixing 	Fabrication and thermal joining	The processes and techniques listed below: <ul style="list-style-type: none"> ◆ thermal joining: welding (mig, spot and electric arc), soldering, brazing ◆ mechanical fixing: riveting (snaphead, countersink and pop), screw-fixing ◆ metalwork adhesives ◆ heat-treatment methods: annealing, hardening and tempering
Sustainability and recycling	Understand and follow workshop recycling practices and processes.	Sustainability and recycling	Best practice in selecting materials that are appropriate for a specific use. Understand and follow workshop recycling practices and processes.

Skills, knowledge and understanding included in the course are appropriate to the SCQF level of the course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.scqf.org.uk).

Skills for learning, skills for life and skills for work

This course helps candidates to develop broad, generic skills. These skills are based on [SQA's Skills Framework: Skills for Learning, Skills for Life and Skills for Work](#) and draw from the following main skills areas:

2 Numeracy

2.2 Money, time and measurement

4 Employability, enterprise and citizenship

4.3 Working with others

5 Thinking skills

5.3 Applying

5.5 Creating

These skills must be built into the course where there are appropriate opportunities and the level should be appropriate to the level of the course.

Further information on building in skills for learning, skills for life and skills for work is given in the course support notes.

Course assessment

Course assessment is based on the information provided in this document.

The course assessment meets the key purposes and aims of the course by addressing:

- ◆ breadth — drawing on knowledge and skills from across the course
- ◆ challenge — requiring greater depth or extension of knowledge and/or skills
- ◆ application — requiring application of knowledge and/or skills in practical or theoretical contexts as appropriate

This enables candidates to:

- ◆ apply skills, knowledge and understanding developed through the course to manufacture a finished product in metal to a given standard
- ◆ demonstrate practical creativity and problem-solving during the manufacturing process
- ◆ apply skills, knowledge and understanding to unfamiliar practical metalworking situations

Course assessment structure: question paper

Question paper

60 marks

The question paper gives candidates an opportunity to demonstrate skills, knowledge and understanding relating to:

Area	Range of marks
Measuring and marking out tools	4–6
Reading and interpreting drawings	4–6
Materials	4–6
Common bench tools	5–7
Sheet metalwork equipment and processes	4–6
Machine processes	6–8
Machine parts and tools	6–8
Finishing	3–4
Fabrication and thermal joining	4–6
Health and safety	6–8
Sustainability and recycling	3–5

The question paper has 60 marks out of a total of 130 marks. This is scaled by SQA to represent 30% of the overall marks for the course assessment.

A proportion of marks are available for more challenging questions, which generally require interpretation and/or integration of more complex practical metalworking situations. This could be in the complexity of the expected response, the descriptions and/or justifications of more detailed and/or complex processes, or problem-solving.

Questions will allow for a variety of response types including, short/limited responses and extended responses.

Setting, conducting and marking the question paper

This question paper is set and marked by SQA and conducted in centres under conditions specified for external examinations by SQA.

Candidates will complete this in 1 hour.

Specimen question papers for National 5 courses are published on SQA's website. These illustrate the standard, structure and requirements of the question papers candidates sit. The specimen papers also include marking instructions.

Course assessment structure: coursework

Practical activity

70 marks

The practical activity allows candidates to demonstrate the application of skills and knowledge developed during the course to produce a finished product, to a given standard and specification.

The practical activity will be to manufacture a product and complete a log book. The log book will be provided as part of the assessment task.

Marks are awarded for:

Area
Log book
Bench work
Machining
Fabrication
Finishing
Overall assembly

The practical activity gives candidates an opportunity to demonstrate the following skills, knowledge and understanding:

- ◆ selecting and using a range of metalworking tools, equipment and materials
- ◆ reading, interpreting and following given working drawings, outline specification information and cutting lists
- ◆ marking out, cutting and shaping component parts
- ◆ fabricating and joining metalwork components
- ◆ manufacturing a finished product to given drawings and standards
- ◆ working and using tools and equipment in accordance with recognised procedures and safe working practices

The practical activity has 70 marks out of a total of 130 marks. This is scaled by SQA to represent 70% of the overall marks for the course assessment.

Practical activity overview

The standards and tolerances applicable to the product are as follows:

Operation	Tolerance
Individual components	
Marking out	±0.5mm
Fitting work	±0.5mm
Sheet metal work (cutting)	±1mm
Bending work — sheet metal	±2mm
Bending work — metal strip/ bar	±5mm
Forge processes (twisting, drawing down and flattening)	±3mm
Assembly, joining and fitting	
Functional sizes	±0.5mm linear
Thermal joining	Minimum length of 20mm consistent in width
Pedestal drill	
Drilling and countersinking	±0.5mm
Centre lathe	
Parallel turning, facing and chamfering	±0.5mm linear ±0.2mm diameter

The product will allow candidates to demonstrate skills and apply knowledge gained from the course.

Hand, power and machine tools will be used in the manufacture of the product, as specified in the practical activity.

The product surfaces will be well-prepared and finished as specified. However, no external finish is to be applied to the product.

While working on the practical activity, candidates must adhere to recognised safe working practices as well as those stipulated within their centre.

Functional dimensions

Functional dimensions are specified within the assessment task.

Setting, conducting and marking the practical activity

This practical activity is:

- ◆ set by SQA, on an annual basis
- ◆ conducted under some supervision and control (although a high degree of supervision is required for health and safety purposes)

Evidence is internally assessed by centre staff in line with SQA's marking instructions. All marking is quality assured by SQA.

High level instructions for centres, giving an overview of the product, materials and cutting list, are provided in advance.

Full instructions for candidates, giving specific joining and manufacturing details, are contained within the annually issued assessment task.

Assessment conditions

Time

This practical activity is carried out over a period of time, starting at an appropriate point in the course, once all content has been delivered.

Supervision, control and authentication

The practical activity must be carried out:

- ◆ without interruption by periods of learning and teaching
- ◆ in a workshop environment
- ◆ in time to meet the mark submission date set by SQA
- ◆ on an individual basis by the candidate (ie no group work is permitted)
- ◆ under supervision to ensure that work presented is the candidates' own
- ◆ under supervision to ensure a safe and controlled environment

Resources

The practical activity is undertaken in open-book conditions and, as such, candidates can have access to learning and teaching materials, the internet, notes, exemplar materials, resources on classroom walls or anything similar whilst it is being undertaken.

The practical activity will include instructions for deliverers and candidates and this will detail any equipment or materials that they will need.

Reasonable assistance

Candidates are expected to progress through each stage of the practical activity independently, having acquired the skills earlier in the course. Assessors will intervene throughout the undertaking of the practical activity to ensure the safe running of the workshop environment. However, where the assessor has to intervene, this must be recorded and reflected in the marks awarded in line with the marking instructions.

The practical activity is designed to discriminate between candidates. Once the practical activity has been completed, the product cannot be returned to the candidate for further work.

Evidence to be gathered

Full instructions for the evidence requirements are contained within each assessment task.

This will include:

- ◆ the completed product (and jigs created by the candidate)
- ◆ the completed log book
- ◆ record of any intervention relating to independence of work
- ◆ record of any intervention relating to safe working

All candidate evidence is internally assessed.

Volume

One completed log book and one completed product is required from each candidate.

Grading

A candidate's overall grade is determined by their performance across the course assessment. The course assessment is graded A–D on the basis of the total mark for all course assessment components.

Grade description for C

For the award of grade C, candidates will typically have demonstrated successful performance in relation to the skills, knowledge and understanding for the course.

Grade description for A

For the award of grade A, candidates will typically have demonstrated a consistently high level of performance in relation to the skills, knowledge and understanding for the course.

Equality and inclusion

This course is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

For guidance on assessment arrangements for disabled candidates and/or those with additional support needs, please follow the link to the assessment arrangements web page: www.sqa.org.uk/assessmentarrangements

Further information

The following reference documents provide useful information and background.

- ◆ [National 5 Practical Metalworking subject page](#)
- ◆ [Assessment arrangements web page](#)
- ◆ [Building the Curriculum 3–5](#)
- ◆ [Design Principles for National Courses](#)
- ◆ [Guide to Assessment](#)
- ◆ [SCQF Framework and SCQF level descriptors](#)
- ◆ [SCQF Handbook](#)
- ◆ [SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work](#)
- ◆ [Coursework Authenticity: A Guide for Teachers and Lecturers](#)
- ◆ [Educational Research Reports](#)
- ◆ [SQA Guidelines on e-assessment for Schools](#)
- ◆ [SQA e-assessment web page](#)

Administrative information

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History of changes to course specification

Version	Description of change	Authorised by	Date

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