



# Contents

|   | Page number(s)    |
|---|-------------------|
| <b>INFORMATION FOR LEARNERS</b><br><b>Scenario for the assignment</b><br>This section contains the assignment background which learners will need to be familiar with in order to complete the tasks.<br><b>Your Tasks</b><br>This section contains all the tasks learners must complete before work can be submitted for assessment. | 3<br>4<br><br>5–6 |
| <b>INFORMATION FOR TEACHERS</b><br><b>Guidance on using this assignment</b><br>This section provides guidance to centre staff on the preparation and completion of the assignment.  | 7<br>8–14         |

## OCR-set Assignment

### Information for Learners

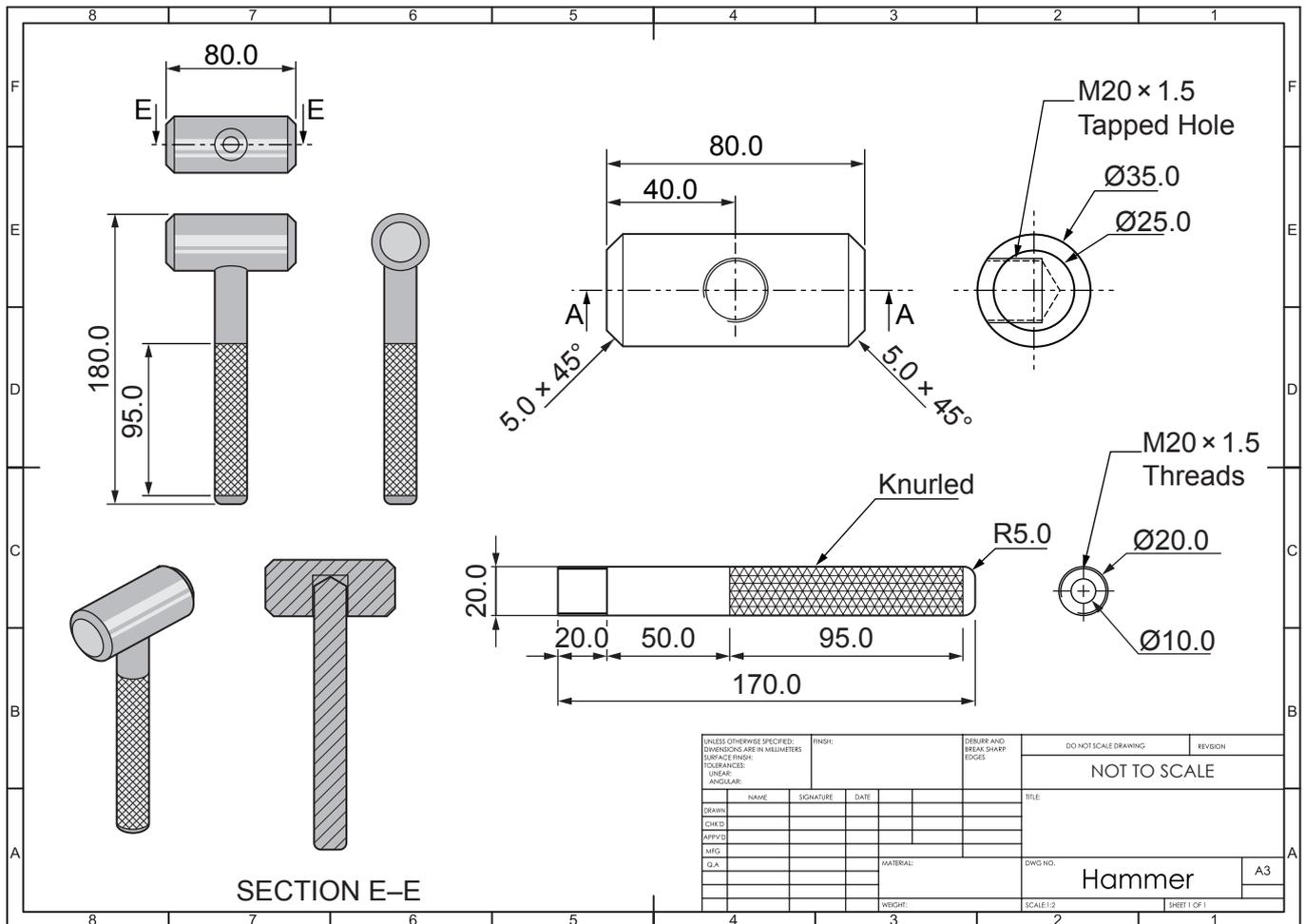
OCR Level 1 / 2 Cambridge National Certificate in Engineering Manufacture

R111: Computer aided manufacturing

# Scenario for the assignment

The 'aluminium hammer' prototype pre-production product produced in unit R110 has been approved for manufacture. The aluminium hammer is to be produced using CNC manufacturing methods.

The component drawing is shown below:



**Read through all of the tasks carefully, so that you know what you will need to do to complete this assignment.**

# Your Tasks

## Task 1 – Plan the production of components on Computer Numerical Control (CNC) machines

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Learning Outcome 1, Be able to plan the production of components on Computer Numerical Control (CNC) machines; and Learning Outcome 2, Be able to interpret information from Computer Aided Design (CAD) to manufacture components on CNC equipment, are assessed in this task.

A small batch quantity of a minimum of two 'aluminium hammers' are to be manufactured using CNC machining. In order to be successful, the production of the hammer must be carefully planned.

Effective production planning and the interpretation of information obtained from CNC packages are key elements in ensuring an efficient and safe manufacturing process.

You will need to:

- interpret the engineering drawings provided
- produce a CAD drawing to enable on-screen simulation of production
- export drawing information to the CNC machine, and perform on-screen simulation of production, interpreting and acting upon the information gained
- produce a detailed production plan for the batch manufacture of the aluminium hammer using CNC machining considering: safe working practices, the type of CNC machine being used, sequence of machining operations, required tool changes, tool offsets, tools required, the material being machined and the scale of manufacture.

## Task 2 – Set-up and use CNC equipment to manufacture components

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Learning Outcome 3, Be able to set-up and use CNC equipment to manufacture components, is assessed in this task.

Production is about to start. You need to set-up the CNC machine and produce a minimum of two aluminium hammers.

Using safe working procedures and appropriate PPE you will need to:

- select appropriate tools and equipment to correctly set-up the CNC machining operation
- produce a minimum of two aluminium hammers using CNC machining
- produce a comparison of manual and CNC produced components (with reference to the hand-made product from Unit R110).

You should demonstrate your ability to draw upon relevant skills/knowledge/understanding from other units you have studied in this task.

## Task 3 – Applications of computer controlled processes used to manufacture products

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Learning Outcome 4, Know about applications of computer controlled processes used to manufacture products, is assessed in this task.

The company wishes to invest in additional computer controlled process equipment in order for it to improve its manufacturing facilities. The company wishes to be able to work with a range of materials for one-off/prototype, batch and high-volume production.

The production manager has asked you to prepare a report that would consider opportunities for computer controlled production in its domestic appliance division.

Consider how rapid prototyping, manufacturing processes and robotics could be used for one-off/prototype, batch and high-volume production of a product and its sub-assemblies within domestic appliance manufacture.

You are to produce a report to the production manager:

- outlining the range of opportunities for computer controlled processes used in manufacturing
  - rapid prototyping
  - manufacturing processes (CNC, additive manufacturing)
  - robotics.
- a description with examples of computer controlled processes used for different scales of manufacture.

## OCR-set Assignment

### Information for Teachers

OCR Level 1 / 2 Cambridge National Certificate in Engineering Manufacture

R111: Computer aided manufacturing

# Guidance on using this assignment

## 1 General guidance

- 1.1 OCR assignments are available to download free of charge from our website: [www.ocr.org.uk](http://www.ocr.org.uk)
- 1.2 OCR assignments are intended to be used for summative assessment of learners. The OCR specification gives more information on the arrangements for assessing internally assessed units.
- 1.3 This assignment has been designed to meet the full assessment requirements of the unit. Learners will need to take part in a planned learning programme that covers the underpinning knowledge, understanding and skills of the unit.

## 2 Before carrying out the assignment

- 2.1 Learners should be provided with a copy of the *Information for Learners* section of this assignment.
- 2.2 Learners will not need to carry out any preparations prior to undertaking the assessment tasks, such as collating resources to use in the assessment.
- 2.3 We have estimated that it will take approximately 10–12 hours to complete all tasks. Learners would need approximately 3–4 hours to complete Task 1 and approximately 4–6 hours to complete Task 2 and approximately 1–2 hours to complete Task 3. These timings are for guidance only but should be used by the teacher to give learners an indication of how long to spend on each task. Centres can decide how the time can be allocated between each part or individual task. Centres are also permitted to spread the tasks across several sessions and therefore it is permissible for evidence to be produced over several sessions.

## 3 When completing the assignment and producing evidence

- 3.1 Each learner must produce individual and authentic evidence for each task within the assignment.
- 3.2 Centre staff may give support and guidance to learners. This support and guidance should focus on checking that learners understand what is expected of them and giving general feedback that enables the learner to take the initiative in making improvements, rather than detailing what amendments should be made. It is not acceptable for teachers/deliverers to provide answers, to work through answers in detail or to detail specifically what amendments should be made.
- 3.3 Learners may use information from any relevant source to help them with producing evidence for the tasks.
- 3.4 Learners must be guided on the use of information from other sources to ensure that confidentiality is maintained at all times.

- 3.5 Usually, the type of evidence required may be modified, with the exception of certain types of evidence listed below under '*Permitted changes*'. It is important to note that it is possible to generate the evidence in a variety of formats. Centres must advise learners as to the most appropriate format of evidence. The nature of this assessment means that learners are free to use the format that they feel is most appropriate for the purpose and target audience for each individual task (see Section 6).

#### 4 Presentation of work for marking and moderation

- 4.1 Centres wishing to produce digital evidence in the form of an e-portfolio should refer to the appendix in the specification on guidance for the production of electronic assessment.
- 4.2 Centres may wish to discourage learners from excessive use of plastic wallets for presentation of their evidence as this may hinder the assessment process. Instead centres may wish to encourage learners to present their work so that it is easily accessible, e.g. spiral bound, stapled booklet, treasury tag.
- 4.3 All work must be marked against the marking criteria for the unit. Marks are allocated to learning outcomes rather than tasks. Please see Appendix B Marking criteria for centre assessment and Section 4, The centre assessed units, in the specification for this qualification for more information on marking, moderation and submission of work.

#### 5 Scope of permitted set assignment modification

The set assignment is self-contained in its present form. The set of tasks form a coherent whole addressing all the learning outcomes and allowing access to the full range of marks.

##### **You must not change the following:**

- the learning outcomes
- the marking criteria
- the requirements for supervision and authentication as described in the specification (Section 4 *The centre assessed units*)
- the maximum duration for completion of the assignment.

##### Permitted changes:

The set assignment can be modified in terms of the areas described below but centres must be sure that learners still have the opportunity to cover all of the learning outcomes and to access the full range of marks:

- the scenario, which can be contextualised or amended to suit local needs
- each specific task may be appropriately contextualised to match with any permitted changes you have made to the scenario.

Should the centre change the context of the assignment they must make sure that the product to be designed and prototyped is of equal complexity to that given in this set assignment.

OCR has ensured that in the language used and the tasks and scenario provided we have avoided discrimination, bias and stereotyping and support equality and diversity. In the development of qualifications and assessments we use the guidance given in the Ofqual publication *Fair access by design*, notably this includes:

- using language and layout in assessment materials that does not present barriers to learners
- using stimulus and source materials in assessment materials (where appropriate) that do not present barriers to learners.

If centres wish to modify the set assignment we strongly advise that staff responsible for modifying the set assignment and the quality assurance of it refer to the publication *Fair access by design*.

**If modifications are made to the set assignment, whether to just the scenario or to both the scenario and individual tasks, it is up to the centre to ensure that all learning outcomes can still be met and that learners can access the full range of marks.**

## 6 Specific guidance on the task

ICT facilities including digital photography and/or video will be required to produce the portfolio of evidence required for assessment.

A portfolio of evidence should be produced for assessment. This may be presented in the form of an electronic portfolio containing both written and video evidence showing all processes and procedures involved in the manufacture of the prototype product with written evidence to support production planning and quality control tasks.

### Task 1

Learners should follow relevant safe working procedures and practices and wear appropriate PPE in relation to the activity being carried out. Learners could produce CAD drawings suitable for simulation and export to the CNC machine, based upon the information provided from the working drawing given in this document. Should learners fail to produce a suitable drawing of the component to enable simulation and export to take place, the centre may supply working CAD drawings to them in order to complete the later stages of the assignment.

Learners will require access to programming and CNC machining software to complete the task. They should independently complete an on-screen simulation and production of the production plan.

### Task 2

Learners should independently follow procedures to set-up the machining operation. They should produce a minimum of two fully assembled components using CNC methods that can be compared to the product produced in R110 using manual methods. The comparison should include visual, dimensional, cycle time and consistency. The component parts require a minimum of two operations from CNC machining.

In order to complete LO3 of R111 it is highly recommended that the learner manufactures the same component for both R110 and R111 to enable a comparison to be made. If the learner has manufactured a different component in R110 to that produced in R111, it will be necessary for them to make a reasoned comparison of the components using, i.e. visual appearance, dimensional accuracy, cycle time and consistency.

Learners could use knowledge gained in unit R109 to identify appropriate manufacturing methods.

### Task 3

Learners should produce a report to the production manager:

- outlining the range of applications for a company for their use of computer controlled processes used in manufacturing. These could include:
  - rapid prototyping
  - manufacturing processes (CNC, additive manufacturing)
  - robotics.
- a description with examples of computer controlled processes used for different scales of manufacture.

**Total marks for assignment: 60**



# Witness Statement – Task 3

|                     |   |
|---------------------|---|
| <b>LEARNER NAME</b> |   |
| <b>Date</b>         |   |
| <b>Unit</b>         | R111 – Computer Aided Manufacturing   |
| <b>LO2 and LO3</b>  | Be able to interpret information from CAD to manufacture components on CNC equipment and be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components |

| <b>Independent working to manufacture, whilst following appropriate safety precautions</b> |  |
|--|--|
| <b>Witness observations</b>  |  |

Name of witness: \_\_\_\_\_

Relationship to learner: \_\_\_\_\_

| <b>Assessor comments: How the observations demonstrate achievement against the marking criteria</b> |
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**RECORD OF QUESTIONS/ANSWERS (if applicable)**

|                            |  |
|----------------------------|--|
| <b>ASSESSOR QUESTION 1</b> |  |
|                            |  |
| <b>LEARNER RESPONSE 1</b>  |  |
|                            |  |
| <b>ASSESSOR QUESTION 2</b> |  |
|                            |  |
| <b>LEARNER RESPONSE 2</b>  |  |
|                            |  |
| <b>ASSESSOR QUESTION 3</b> |  |
|                            |  |
| <b>LEARNER RESPONSE 3</b>  |  |
|                            |  |

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|----------------------------|--|--------------|--|
| <b>ASSESSOR SIGNATURE:</b> |  | <b>DATE:</b> |  |
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|---------------------------|--|--------------|--|
| <b>LEARNER SIGNATURE:</b> |  | <b>DATE:</b> |  |
|---------------------------|--|--------------|--|