Level 1 / Level 2 Examiners' Report

Engineering (Technical Award)

Level 1/ 2

Summer 2024

Introduction

Our Principal Examiners' report provides valuable feedback on the recent assessment series. It has been written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and details how candidates have performed in each unit.

This report opens with a summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It then looks in detail at each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.[1]

The information found in this report provides valuable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	WJEC offers an extensive programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.wjec.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 12 months after the examination.	Portal by WJEC or on the WJEC subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the subject, rather than for each unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results, Grade Boundaries and PRS (wjec.co.uk)

[1] ***Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.***

Exam Results Analysis	WJEC provides information to examination centres via the WJEC Portal. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	Portal by WJEC
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.wjec.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	Portal by WJEC or on the WJEC subject page.
Become an examiner with WJEC.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with valuable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner | WJEC

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Executive Summary

Overall

This report offers a comprehensive review of Unit 1, Unit 2, and Unit 3 within the Level 1/2 Engineering (Technical Award) qualification, analysing their respective Assessment Objectives (AOs) and performance trends observed during the Summer 2024 assessment series.
The assessment highlighted significant achievements and promising developments across all units, showcasing candidates' solid foundational skills in practical engineering applications, digital proficiency, and critical analysis.
Areas for improvement include enhancing conceptual clarity in theoretical questions, reinforcing understanding of material properties and testing, and ensuring thorough question comprehension to prevent misconceptions. Recommendations focus on refining delivery methods, improving task differentiation, and enhancing assessors' familiarity with assessment requirements, aiming to bolster candidate competencies in engineering problem-solving.

Unit 1: Manufacturing Engineering Products

The unit, constituting 40% of the qualification, focuses on technical knowledge, practical skills application, and critical analysis.

Key observations include improved quality in components produced, but identified areas for improvement:

- The interpretation of technical data alongside engineering drawings.
- The need for more detailed and specific Health and Safety risk assessments.
- Insufficient depth in evaluating work against engineering criteria and suggesting improvements.

While candidates showed strengths in identifying components and using digital portfolios, improvements are recommended in planning manufacturing processes and enhancing evaluation practices. Centres are encouraged to address these areas to improve candidate performance across all assessment objectives.

Unit 2: Designing Engineering Products

Unit 2 of the Level 1/2 Engineering (Technical Award) emphasizes the design and improvement of engineering products through structured tasks. This assessment series witnessed an increase in digital portfolio usage, offering candidates more presentation flexibility, although some tasks were generously marked.
Candidates generally excelled in identifying primary product features and integrating Unit 1 modifications into designs. Connections made between chosen products and design modifications were clear, but some struggled with articulation. Justifications for product selections varied in quality, with higher-scoring portfolios effectively integrating chosen products. Design development saw improvements in sketching and CAD modelling, yet some lacked detailed annotation needed for higher marks.
Evaluations against briefs and specifications varied, with stronger responses demonstrating clear understanding and justification of design choices. Drawing quality and specification creation showed overall improvement, though some lacked essential manufacturing details. Mathematical applications were generally proficient, but top-scoring responses sometimes lacked comprehensive calculations.

Moving forward, improvements should focus on clearer task differentiation, enhanced annotation in sketches and drawings, and ensuring adherence to specific mark scheme criteria across tasks. Centres are encouraged to refine delivery methods and ensure assessors are well-versed in assessment requirements for future series.

Unit 3 - Solving Engineering Problems

There was a strong participation among candidates, with most attempting all questions on the paper. However, there were occasional instances where candidates overlooked details in the questions, emphasizing the importance of thorough comprehension before responding. Notably, candidates displayed commendable knowledge of general Health and Safety practices and effective application of real-world insights to tackle the final question. While questions on Health and Safety received satisfactory responses overall, there was room for improvement in detailed understanding of material testing and properties, which were less commonly addressed.
Overall, the assessment revealed a solid foundation in practical engineering applications among candidates, with strengths in hands-on tasks and operational procedures. Areas for improvement include enhancing conceptual clarity in theoretical questions, reinforcing understanding of material properties and testing, and ensuring thorough question comprehension to avoid misconceptions in responses.

Areas for improvement	**Classroom resources**	**Brief description of resource**
Interpreting engineering drawings.	Chapter 2 – Companion book. Previous series Unit 1 task drawings.	A companion book produced by WJEC to support the delivery of this qualification. Previous series drawings can be used to practice interpretation.
Creating Health and Safety risk assessments	Access to the HSE website	Information available to support learning of risk assessments with examples.
Evaluating against engineering criteria – Measurement and tolerances.	Chapter 2 – Companion book	A companion book produced by WJEC to support the delivery of this qualification.
Engineering drawing conventions	Chapter 2 – Companion book Previous series Unit 1 task drawings	A companion book produced by WJEC to support the delivery of this qualification. Previous series drawings can be used to learn applied conventions.
Exam question interpretation	Previous series exams Page 15 – onwards of the unit 3 delivery guide	Previous series exams to practice interpretation. A guide to developing own questions and papers to practice interpretation.
Understanding of material properties and testing	Chapter 2 – Companion book	A companion book produced by WJEC to support the delivery of this qualification.

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UNIT 1 – MANUFACTURING ENGINEERING PRODUCTS

Overview of the Unit

This is the third series of the unit, and it is encouraging to see that there is continued growth of the number of centres taking up the qualification. For new centres, this overview will set a focus for the detailed area of the report which will address key areas of each task within the unit.

Unit 1 comprises of three Assessment Objectives which are applied throughout the range of tasks linked to the unit.

AO1 requires candidates to demonstrate knowledge and understanding from across the specification.

AO2 focuses on the application of skills knowledge and understanding in a variety of contexts and in the planning and carrying out of investigations and tasks. This AO also includes the application of practical skills.

AO3 requires candidates to analyse and evaluate information whilst making reasoned judgments and presenting their conclusions.

The combined weighting of the three AOs in Unit 1 contribute to 40% of the overall qualification.

Unit 1 focuses on the production of engineered products. Through a range of topics, candidates are expected to:

Understand Engineering Drawings (1.1) through the interpretation of the provided technical details and data packs.

Plan operations (1.2) by identifying appropriate materials, tools and equipment and then planning and sequencing the manufacturing whilst considering contingencies for a range of possible problems or unforeseen events.

Use engineering tools and equipment (1.3) to undertake the manufacture of the engineered product using the details and data from the given engineering drawings. Candidates must also undertake risk assessments of their processes and environment.

Implement engineering processes (1.4) safely whilst applying appropriate Health and Safety practices whilst undertaking practical tasks. Candidates are also expected to use a variety of suitable materials before finally evaluating their own practices and processes.

General overview of the performance across the unit.

This series saw a range of methods to present and detail the work of candidates. A large number of centres are now working with digital portfolios and in most cases, the evidence provided by individual candidates displayed unique presentation styles with less reliance on centre provided templates which, if used, limit the accessibility of the candidate(s) to meet the higher bands of the mark ranges within the mark scheme.

There was clear evidence from a range of centres that assessors and candidates now have a better understanding of the expectations of the unit, and this is clear in some of the high order skills seen across many of the unit 1 tasks.

There are still key areas within the assessment tasks which require developing by centres, especially those new to the specification and undertaking the assessments for the first time.

When reviewing the previous series, there was a marked improvement in the quality of components produced by candidates and the overall quality and level of finish seen within the samples. Whilst this was to be expected with a smaller winter series, centres have clearly taken on board key areas from the last report, CPD events and other available resources.

There was also evidence of improved contingency planning and the clarification of stock sizes and profiles which appear in all bands of the appropriate section of the mark scheme. There are also areas which many centres need to develop further to allow access to the higher mark bands. These fall into three main areas which were quite consistently seen by the moderation team during this series.

These are:

- Limited application of technical data supplied alongside the engineering drawings
- Health and Safety risk assessments which were generic in nature and lacked detail of risk level and how to mitigate the identified risks.
- Evaluations tended to often review the entire making process and often lacked the required review against the criteria given in the engineering drawings and specification. Candidates often failed to address accuracy against given tolerances and showed limited responses to evaluating their own practices and processes.

There were also often simple or superficial suggestions for appropriate improvements.

Comments on individual questions/sections

Task 1 (a) (10 Marks) - AO1 (4 Marks)

This task was undertaken well by most candidates who were able to clearly identify the key components of the engineered product. A high number of samples seen used the method of annotating the supplied engineering drawings, this gave candidates the opportunity to focus on each part individually and provide detailed responses which met the mark scheme.

There was evidence of some candidates misinterpreting this task and instead of identifying the key components of the engineered drawing, they identified areas of the provided individual engineering drawings, this resulted in statements relating to identifying line types, centre lines and diameter symbols. This should be avoided in future submissions as responses do not address the mark scheme for this task.

Task 1(a) – (10 Marks) - AO3 (6 Marks).

There was a varied response in this series to AO3 which can likely be attributed to the number of new centres undertaking the specification for the first time. To address the mark scheme fully, candidates should include an analysis of key information needed to produce the engineered prototype. Marks awarded in the higher band requires evidence of speeds for machining various materials and tapping drill sizes. This information can also be researched by the candidate as the information in the provided data pack is not exhaustive.

Where assessment for AO3 was identified as generous, it was typically due to band three being applied without evidence of the above-mentioned areas. With that in mind, a good proportion of candidates were still addressing the descriptors for band two in this task by identifying chamfers, through holes and other appropriate details for the band.

By ensuring that candidates understand the application of the data packs by gaining familiarity in their use early in the course, would clearly be a benefit to them applying the information fully during the assessment of this task.

Task 1(b) - (4 Marks)

As with the winter series, candidates clearly understood the requirements of this task, and this was evident in the quality of responses seen in moderation. There was a range of methods used to present the information clearly which assisted candidates when producing the components. The use of tables and charts was common in portfolios and digital portfolios made the presenting of the evidence more consistent and visually stronger.

Candidates would often use scans of individual components to break down the information and in many cases, the details were linked into the planning stages in task 2(b). In some examples, candidates had used CAD to clarify details of component parts as an aid to visualise the final component part.

Candidates who hand wrote or drew tables were not penalised by not using digital portfolios although the information in many of these instances was less well organised and lacked in the level of detail seen in digital formats.

Task 2(a) - (10 Marks)

This task saw continued improvement in the number of candidates addressing all areas of the mark scheme and across all bands of assessment. The identification of stock and stock sizes/profiles was clearly evident in a high volume of samples seen in moderation. Candidates would often include visual representations of stock profiles in the form of sketches to clarify their understanding. Being able to identify stock in this way allows the candidate to develop familiarity with the process and later help them apply this knowledge in tasks in unit 2.

Materials, tools and equipment were often identified in detail, and this clearly showed where candidates had gained familiarity through prior work on the course.

Candidates approached this task in many different ways. In some candidate evidence, materials were identified as notes directly on the engineering drawings provided, in others, tables had been produced along with justifications for choices. These were often linked back to stock size and profiles.

Another common method was to include material, tools, and equipment selections directly into the planning stages of task 2(b). This reinforced understanding and knowledge as the details provided linked to the steps identified in the candidates' planning sheets.

Task 2(b) – (10 marks)

Planning the stages of production was well undertaken by a large proportion of candidates. There was less evidence of multiple GANTT charts with minimal detail as seen in previous series where candidates would try and address a number of task outcomes on one or two sheets. This should be avoided as this usually leads to outcomes which lack detail and knowledge.

Contingencies were evident in the majority of evidence seen and this was a key message in previous CPD events. Candidates gave realistic scenarios and feasible solutions to meet unexpected events in the manufacturing stages. These ranged from illness to broken items of equipment and were explained with a good level of detail overall. This should be encouraged to continue as it appears in all mark bands for this task.

In some instances, candidates would have benefited from breaking steps down into main sequence areas to clarify each operation in the manufacturing sequence, ensuring that timings are given for each of the steps. The sequences should also contain sufficient detail to describe the stages of each operation.

Task 2(c) – (6 marks)

The assessment of potential risks is an area that centres need to further develop. Whilst there were good examples of detailed risk assessments, there were still a high number of candidate portfolios where evidence was very generic, did not actually assess the potential risks of equipment and were limited to general statements such as "wear an apron" or "use goggles." In some cases, these statements were not linked to a specific operation or task performed during production.

Candidates who were able to access the higher mark bands in this task provided detailed risk assessments for a number of key tasks. These included details of the level of risk, mitigations to reduce those levels supported by a revised risk level after medications had been put in place. Centres should ensure candidates are familiar with applying risk assessments to the key stages of the processes used and avoid responses where very simple operations are undertaken, such as using an engineers' square. Focus should be on the main production stages as basic hand tools can be grouped into one risk assessment if needed.

Assessors should review the mark bands for this task as the mark scheme was often assessed over generously.

Task 3 – (16 marks)

As mentioned, there was a range of excellent skills seen in this series with some very high-quality outcomes. Candidates performed especially well where they had selected a range of suitable materials to produce their prototype. It is important that centres are aware that excessive use of laser cutting, or 3D printing will limit the available marks to the candidate as component parts produced in this way reduce the skill level required and will impact both task 3 and 4a.

To clarify, if the pivot arms on the bike maintenance rig are laser cut from Acrylic, then the candidate would not have undertaken any marking out, centre punching, drilling, or shaping. Finishing would have also been minimal compared to producing the component from aluminium or mild steel. Assessors need to be familiar with this as a prototype which has a high volume of CAM produced components, should be assessed accordingly.

The quality of finishing with many candidates was outstanding and this was often reflected by a high level of accuracy in their components. It is important that centres provide good quality, clear photographs of candidate component evidence which clearly shows the level of finish and the individual component parts. If these are not present in the candidate portfolio, then the moderator needs to request these from the centre before moderation continues.

Task 4(a) – (12 Marks)

This task links closely with Task 3 and assesses the range of processes undertaken by the candidate and the material choices made and used during production of the final prototype. Again, there were many examples of candidates showing excellent skill levels in the processes used during production. Assessors should be aware that the same limitations apply as in Task 3 where CAM is extensively used.

There was a good range of material variation seen in the series including aluminium, brass, and mild steel. These allowed high quality finishes to be achieved by candidates whilst allowing them to show consistent accuracy in their work.

The number of candidates where inappropriate materials were selected to produce their final prototype is far less than last series. Modelling foam and softwoods should be avoided wherever possible as these will create issues when trying to maintain tolerances.

Candidates should be encouraged by centres to make their own selection from a range of materials made available to them. This should ensure a diverse range of submissions from centres which fully meets the requirements of the specification. It also allows better opportunities for candidates to justify their selections earlier in the unit and will increase knowledge and understanding of materials in preparation for undertaking Unit 2.

Task 4(b) – (12 Marks)

This task clearly stood out as the weakest area of the unit as there was a consistent lack of detail from candidates to address the higher bands within the mark scheme. Only a small proportion of candidates addressed the task fully by ensuring that they addressed the criteria from the engineering drawings, evaluated their own practices and processes as well as suggesting improvements where appropriate.

Assessors need to ensure that candidates are familiar with the requirements of this task through practice and preparation earlier in the learning and practice stages.

Whilst this task stands out, there is a significant number of new centres again this year which may explain the unfamiliarity with the task requirement. This should be a key area for centres to focus their course development on to aid candidates to access the higher bands of the mark scheme. It is important that candidates fully understand the expectations of the task by ensuring that the evaluations review the outcomes against the engineering drawings and specification, that they review their own practices and processes and finally consider suggestions for improvements to both the prototype and their own working methods.

Many candidates covered the evaluation of their prototype well with activity diaries and photographic evidence. For future submissions centres need to ensure they address the remaining areas required in the mark scheme for this task.
Summary of the unit.

In general, the moderation of the unit saw detailed evidence in a range of tasks as outlined above. New centres should build on their delivery of the qualification considering the areas highlighted in this report. This will better help candidates address all areas of the mark scheme and help drive the qualification forward in centres.

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UNIT 2 – DESIGNING ENGINEERING PRODUCTS

Overview of the Unit

The volume of entries for this series has allowed for a more comprehensive and complete review of Unit 2 due to only as small number of centres submitted candidates for the unit in the previous summer series and the winter series. For new centres, this overview will set a focus for the detailed area of the report which will address key areas of each task within the unit.

Unit 2 also implements the three Assessment Objectives which are applied throughout the range of tasks linked to the unit. These are:

AO1 requires candidates to demonstrate knowledge and understanding from across the specification.

AO2 focuses on the application of skills knowledge and understanding in a variety of contexts and in the planning and carrying out of investigations and tasks. This AO also includes the application of practical skills.

AO3 requires candidates to analyse and evaluate information whilst making reasoned judgments and presenting their conclusions.
The combined weighting of the three AOs in Unit 2 contribute to 20% of the overall qualification.

Unit 2 allows candidates to experience and gain understanding of how an engineering product is adapted and improved over time.
Candidates will respond to a given brief which requires adaptions or improvements of the product which was produced in Unit 1. Through a range of tasks, candidates will focus on the following topics and be expected to:

Understand function and meet requirements (2.1) by identifying primary features of the given product, identifying products which have similar features and finally explaining the functional requirements of their own design solutions.

Propose Design Solutions (2.2) by generating a range of solutions and then developing them through to a conclusion. Candidates should use appropriate methods to communicate their design ideas.

Communicate an engineering design solution (2.3) through a developed engineering specification and a range of engineering drawings that adheres to recognised drawing standards.

Solve applied engineering problems (2.4) by applying mathematical techniques to clarify or solve problems, specify suitable materials for use in their final engineered solution and suggest appropriate methods for producing the component parts of their final design.

General overview of the performance across the unit.

As with unit 1, this series saw a clear improvement on the range of presentations adopted by candidates to present their work. Again, a large proportion of centres are opting for using digital portfolios which allows candidates to develop their own style of presentation rather that following templates provided by the centre which, if used, limit the accessibility to the mark scheme as the candidate is considered to have been led by the centre.

Assessment of the unit was generally well done however there are a number of tasks which were consistently generously marked. These will be detailed in the task breakdown below.

Sketch work of concepts was improved however there is often still a lack of annotation to explain the iterative process or how the engineered product functions. Models were used by a larger number of candidates this series which allowed access to the higher mark bands as they were able to further explain the design solutions.
A large number of candidates supplemented sketches with additional CAD outcomes which aided in explaining the detail in their concepts.

The production of engineering specifications was more in evidence in this series, however many candidates are still confusing this task with the requirements of task 4(b), where candidates are required to advise a third-party regarding materials and processes for producing their engineered solution.

Assessors tended to be more generous in the marking of engineering drawings this series and there needs to be better familiarisation with both the mark scheme bands and the application of conventions. Whilst there was a sizeable number of orthographic CAD and traditional drawings seen in the series, these were often lacking in detailed dimensions and other key areas described later in the report.

Comments on individual questions/sections

Task 1a(i) - (2 Marks)

Candidates performed well in this task with a sizeable number of samples observed during moderation showing clear understanding of the individual functions of the primary features of the product linked to the brief.

A number of candidates made connections between the product produced in Unit 1 and the required additions of the brief in Unit 2. These portfolios showed clear evidence of candidates making connections between how the modifications would interrelate with the prototype. This is an area which should be developed by all centres as the unit 2 should not be undertaken in complete isolation from Unit 1. It is strongly advisable that candidates take the information from the Unit 1 engineering drawings as a basic starting point to designing the modified prototype. Addressing the task in this way allowed fuller access to the mark scheme.

Task 1 a(ii) - (2 Marks)

Many candidates performed well in this task by suggesting other engineered products that had similar functional properties to those required by the given brief. Products selected were appropriate and learners clearly understood the connections between these products and those modifications required in the brief.

There was a far more reduced number of samples where it was difficult to see clear connections between the selected products and the brief. As with unit 1, candidates should become familiar with this process early in the course to allow these connections to be made.

Task 1b - (5 Marks)

Leading on from task 1a(ii), candidates were clearly able to justify their selections and clearly link where their selected choices could be utilised in their own design process. It was clear from the evidence seen that these choices were integrated into their solutions, by allowing realistic outcomes as which assisted candidates in meeting the brief. Those outcomes which addressed the higher mark band justified fully their decisions by explaining both the reason for selecting the products and where they could be applied to the required modifications outlined in the brief.

2(a) - (4 marks)

As mentioned earlier, sketching of concepts is improving and, in many cases, this is supported by CAD drawings showing 3D views of the product and component parts. Candidates mostly show a good range of ideas which are individual and link to the above tasks.

Many candidates include pictorial information from task 1a(ii) to reinforce links between their selected existing engineered products and the design outcomes they were developing.
An area that centres should review is the level of annotation that is included in support of the sketches produced. A small number of portfolios seen in the sample had just sketches with limited annotation to support the decision process which limits access to the higher end of the mark range in 2(b).

There was a far better range of modelling compared to the last series. CAD models were used as illustrative models to show the overall look and finish of the prototype however, a larger number of candidates displayed physical models using wood, foam, and a range of other materials, to clearly show the details of how their product functioned. These were particularly effective when detailing hinges and moving parts of the design.

Assessors should ensure they are familiar with the assessment requirements for this task as the use of modelling appears in each of the mark ranges.

2(b) - (4 marks)

Evaluations of how the candidates designs met the brief and specification were mixed when looking across the series for this year.

There were a number of high-level responses where evidence showed a clear understanding of candidates evaluating their design proposals fully against the set criteria within the brief and specifications. These were often scored or ranked using a variety of methods to determine the most suitable outcome to progress onwards to the next stages.
There was also a great deal of evidence where responses relied on using the ACCESS FM method to evaluate the proposals however, many of these contained superficial or generic outcomes which limited the candidate's responses to the task.

Centres and assessors need to ensure that evidence for this task focuses on the given criteria from the brief and specification. These need to detail how the outcomes have addressed the problem for each proposal whilst still dealing with the key areas of materials, sizes, tolerances, cost, and operational parameters in a focused way, avoiding generic statements which often had little justifications to address the task requirements.

2(c) - (4 marks)

This task saw a variety of quality CAD drawings being used to present design ideas alongside traditional sketching and drawing techniques. Annotation in this task was weaker this series however there were a number of candidates who did include an excellent level of detail to clarify their designs which was written using a range of effective and precise terminology.

To meet the upper mark range, outcomes need to clearly explain the details of the design, discuss function and technical details such as how something is locked in place, the use of knurling on component parts plus the justification for its use as well as suggested materials and finishes.

The other aspect of this task must consider the way in which the information is presented, and this was undertaken well by a high number of candidates. Again, the use of physical models undertaken by candidates were used here with annotation to explain their design solutions.

The general layouts of presentations were well done although a small number of centres are still using templates for their candidates, again, this should be avoided as the WJEC instructions for conducting controlled assessments clearly states that writing frames etc should not be used.

Task 3(a) - 6 marks

Much of the evidence seen for this task showed that candidates had a good understanding of basic orthographic drawings and of isometric drawings and sketches to support their design solutions. There was, however, a clear trend with this task having marks being generously awarded for the upper section of the mark scheme. Assessors need to ensure familiarity with the requirements of band 3 where the mark scheme clearly states ‘a highly detailed range of dimensions. This was often the main area of error in the awarding of marks as well as a lack of conventions such as hidden detail and centre lines. A high proportion of evidence seen for this task failed to identify any radius and/or diameters on the engineering drawings.

To consider a response for the upper mark band, the evidence should effectively include dimensions for all component parts which could then be passed onto a third party to manufacture from the details provided.

This is an area that should be practiced by candidates early in the course to allow familiarisation and understanding. There are opportunities for candidates to transfer skills and prior knowledge gained from the interpretation of the engineering drawings in Unit 1 which will help them develop their own engineering drawings for their design solution in Unit 2.

Familiarisation of conventions is also important for the knowledge and understanding required by candidates to complete the Unit 3 examination unit.

Task 3(b) - 3 marks

There was a mixed response to this task during the series with evidence of specifications being created but often not fully meeting the mark scheme requirements. There was again a heavy use of ACCESS FM to fulfil the task requirements however, this system does not lend itself well to producing the evidence requirements of the task. Many of the statements seen in responses were generic and lacked the precise details required for a specification.

Where candidates had addressed this task well, there was evidence of technical details, material information and finishing details. Examples of this would be the requirement to have all threaded holes to be countersunk along with the details for this operation. Another common specification point seen was the need to apply a small radius to possible sharp edges such as corners or edges.

As stated in the specification, these details would be required before a third party commences manufacturing.

The specification points should be presented in a method the candidate chooses including adding details to their task 3(a) outcomes or, by creating a table with written details to provide the required information.

Past submissions which have addressed the task well have combined the specification content from Unit 2 2.3.1 and 2.4.2 when selecting materials. This gives the opportunity to address material testing outcomes, which can then be justified and included into the final specification for this task.

Task 4(a) - 4 marks (maths)

There was a positive increase in the number of candidates who performed well in this task where the evidence showed how they had applied relative mathematical techniques to determine a specific problem from the brief.

Common outcomes were seen where candidates had calculated volumes for casting or generated detail costings from stock sizes and component prices before calculating the unit price for one complete prototype.

There was some generous marking seen in this task where candidates had only applied limited calculations or provided an answer only however were marked at the top end of the mark scheme. To achieve the higher mark, candidates must show the calculations, correct answer, and appropriate units.

Centres should ensure that the evidence is relevant to the brief and candidates designed outcome and, that candidates have not simply outputted CAD details such as stress tests or other simulation outcomes as these show no calculations undertaken by the candidate to address the mark scheme for this task.

Task 4(b) - 6 marks

The final task requires candidates to produce a detailed outcome to allow the prototype to be produced by a third party. There was a clear improvement in this task this series but as mentioned earlier in the report, there are some centres and candidates which are confusing this outcome and the specification task (3b).

Successful outcomes showed a clear plan for manufacturing the component parts of the candidates' final design outcomes, supported with details about material removal and shaping, methods of joining components using a range of methods, details of bought in component parts such as bolts and washers. These were often justified and in the higher band responses, candidates had clearly applied skills developed in the unit 1 task and applied these thoroughly in this area of the unit.

Conclusion

This unit is continuing to develop well across centres and the quality of evidence seen has improved in detail since the winter series. Centres should focus on the areas mentioned in the report to fine tune the delivery of the specification and ensure that assessors are familiar with the task outcomes and mark scheme where some element of generous marking has been identified.

The course continues to grow from strength to strength and it is rewarding to be able to see the many examples of high-quality outcomes across both units.

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UNIT 3 – SOLVING ENGINEERING PROBLEMS

Overview of the Unit

Most candidates attempted most questions on the paper. In a few cases, there was evidence of candidates not having read questions carefully before answering. It is most important that candidates take the time to read the question paper before attempting to answer questions, as this can help to ensure that basic errors are avoided.

Candidates have a good knowledge of general Health and Safety; this was highlighted throughout the paper. It was pleasing to see candidates using their real-world knowledge to help in answering the last question.

Questions relating to the knowledge of Health and Safety within engineering were generally quite well answered, but detailed knowledge of testing materials and material properties was less common. Answers to questions about basic engineering processes were quite pleasing to mark this summer.
There were many well answered papers and some of the answers within the extended answer questions showed good subject knowledge.

Comments on individual questions/sections

Q.1 (a)(i) Most candidates were able to state ‘welding’ or ‘brazing’ as a possible method for joining both frames together.

(ii) Popular answers for this question were “fully functioning brakes” and a method for balance when the bike is stopped.

(iii) This question was answered reasonably well with most candidates able to name a suitable material for the seat post and a property that makes rubber a suitable material for the handlebar grips. ‘Corrosion resistance’ was the most common answer to the final part of this question.

(iv) A well-answered question with candidates suggesting the use of a surface finish on the main body of the bike would ‘protect the frame from corroding/rusting’ and ‘to make it look aesthetically pleasing/look good’.

(b) Candidates struggled to answer this question. Many mixed up tensile strength with compressive strength, which did not answer the question. The few who answered it correctly designed a set up where the brake lever was clamped in a vice, and weights were attached to it. The movement in the brake lever would then be measured.

(c) This question was answered very well, with most candidates able to name two different semi-permanent joining methods used on the bicycle. Popular semi-permanent methods included nuts and bolts, self-tapping screws and quick release mechanisms.

Q.2 (a) (i) Mild steel and aluminium were the most popular answers for the first part of this question. Appropriate properties were stated for using the metal.

(ii) Most candidates described some sort of jig or the use of a depth gauge to ensure that all pips are drilled to the same depth.

(iii) The responses to this question were very good. Candidates showed that they could again draw on their experiences from working in the workshop to name the tools and describe their uses. The digital calliper caught a few out, when they incorrectly called it a 'vernier calliper'. There was no vernier scale on the callipers in the picture.

(b) This question was answered very well. Candidates were familiar with the process of creating a chamfer on an edge and could explain the whole process in detail, using notes and sketches. Some chose to carry out the task using a hand file, while others chose to use a milling machine to do it.

(c) (i) Most candidates attempted this question, but very few managed to use their measuring skills to mark out the pips accurately on the surfaces. Simple measuring techniques could easily be used to mark both surfaces.

(ii) Most candidates were able to calculate how many lengths of square section metal would need to be ordered for this task. Some calculated how many pieces could be cut from the initial 400mm length but did not carry on with the rest of the calculation.

(iii) A very well-answered question. The responses for this showed that candidates know how to work safely in the workshop. This is always pleasing to see.

Q.3 (a) (i) The majority of candidates were able to identify the machine in the picture as a milling machine, with many able to name an engineering process that can be carried out on it.

(ii) This question was answered very well, with many candidates drawing on their experiences in the workshop to list four sequential steps to cut 2mm off the surface of a piece of square section aluminium. Answers referred to setting up the machine, clamping the material down, set the correct speed, position the cutting tool near the material and turning the table traverse for the desired cut.

(iii) This question was answered well, with most candidates being able to suggest two ways of prolonging the life of the cutting tool. The most popular answers included: 'move the bed/material at a suitable speed', 'use the correct cutting speed and feed rates' and the use of a 'coolant'.

(b) (i) This question was not answered well at all. Only a very small number of candidates were able to name 'triangulation' or 'trussing' as methods of reinforcing a structure to make it stronger.

(ii) This question was answered well with candidates discussing the major differences between and old-style roller coaster and a modern roller coaster. Candidates commented on changes to materials to manufacture both the track and cart, improvements in safety measures, track design/complex tracks and the use of CAD to simulate the ride before manufacture.

(iii) The main points that were made in this answer referred to the dismantling of the roller coaster, reusing the material, recycling the material, and the complexity of dismantling the roller coaster while the park is still operational. There were some very good answers here that highlighted candidates' knowledge of environmental issues.

Q.4 (a) It was pleasing to see so many candidates using all the available space to complete their answer for this question. There were many well-developed answers, resulting in high marks out of the total available. There was an equal balance of fully developed answers and bullet-pointed sentences used to answer this question.

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