1145-32 Level 2 Advanced Technical Extended Diploma in Engineering

2023

Qualification Report

Contents

Introduction

This document has been prepared by the Chief Examiner and Principal Moderator; it is designed to be used as a feedback tool for centres in order to enhance teaching and preparation for assessment. It is advised that this document is referred to when planning delivery and when preparing candidates for City & Guilds Technical assessments.

This report provides general commentary on candidate performance in both the synoptic assignment and theory exam. It highlights common themes in relation to the technical aspects explored within the assessment, giving areas of strengths and weakness demonstrated by the cohort of candidates who sat assessments in the 2023 academic year. It will explain aspects which caused difficulty and potentially why the difficulties arose.

The document provides commentary on the following assessments:

- 1145-530 Level 3 Engineering - Theory exam (1)
  - March 2023 (Spring)
  - June 2023 (Summer)
- 1145-532 Level 3 Engineering - Theory exam (2)
  - March 2023 (Spring)
  - June 2023 (Summer)
- 1145-031 Level 3 Engineering - Synoptic assignment (1)
- 1145-034 Level 3 Engineering - Synoptic assignment (2)

Qualification Grade Distribution

The approximate grade distribution for this qualification is shown below:
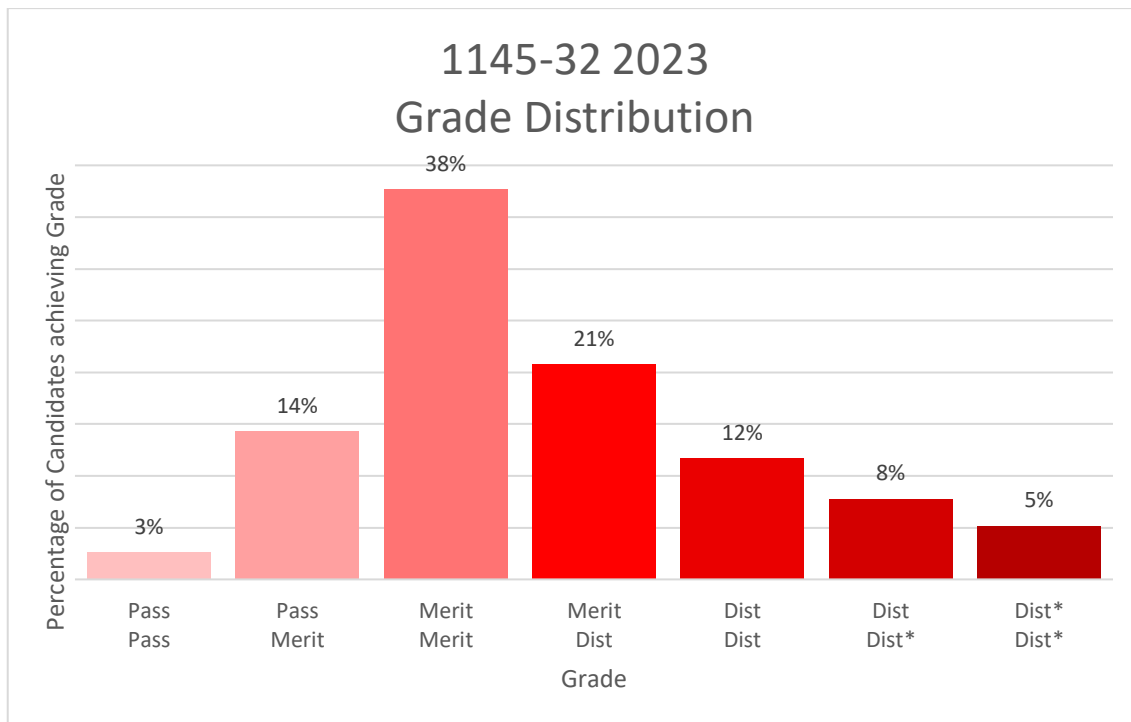
This data is based on the distribution as of 11th August 2023.

Please note City & Guilds will only report qualification grades for candidates who have achieved all of the required assessment components, including Employer Involvement, optional units and any other centre assessed components as indicated within the Qualification Handbook. The grade distribution shown above could include performance from previous years.
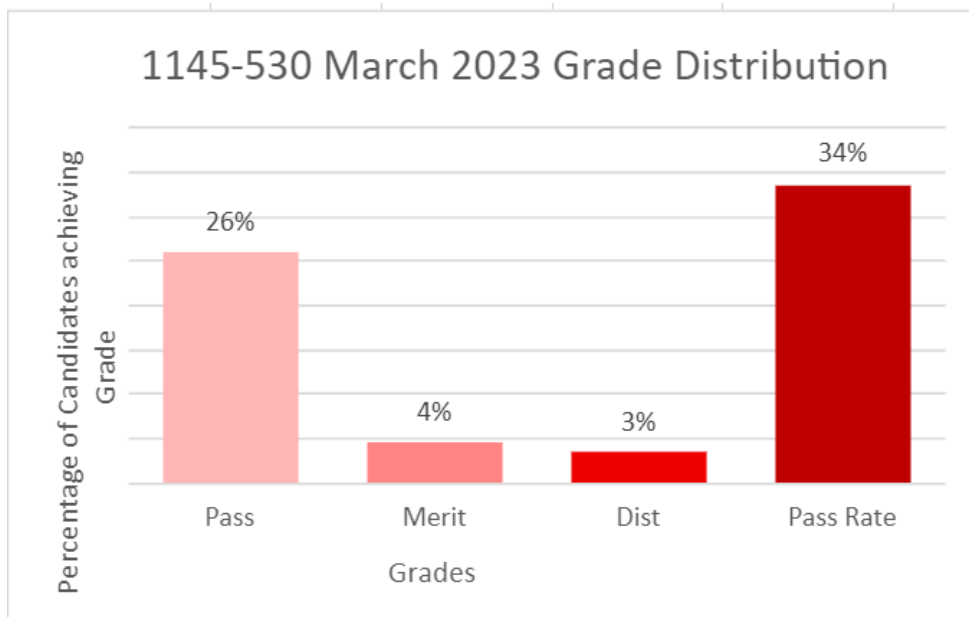
Theory Exam

Grade Boundaries

Assessment: **1145-530 Level 3 Engineering – Theory exam**
Series: **March 2023**

Below identifies the final grade boundaries for this assessment, as agreed by the awarding panel:

Total marks available	100
Pass mark	38
Merit mark	53
Distinction mark	68

The graph below shows the approximate distributions of grades and pass rate for this assessment:

1145-530 March 2023 Grade Distribution

Assessment: **1145-530 Level 3 Engineering – Theory exam**
Series: **June 2023**

Below identifies the final grade boundaries for this assessment, as agreed by the awarding panel:

Total marks available	100
Pass mark	39
Merit mark	54
Distinction mark	69

The graph below shows the approximate distributions of grades and pass rate for this assessment:
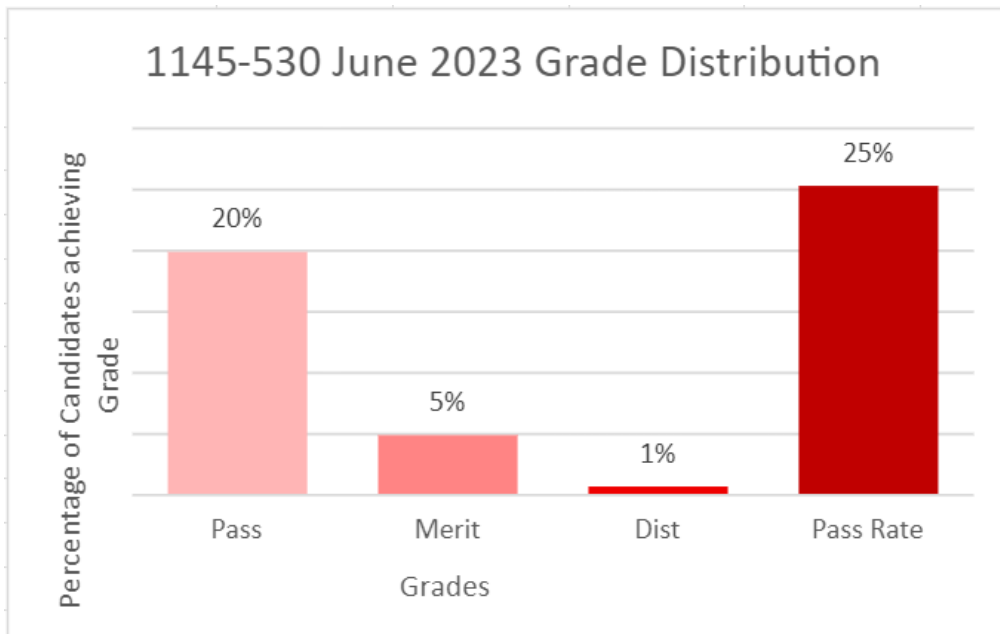
Assessment: **1145-532 Level 3 Engineering – Theory exam (2)**
Series: **March 2023**

Below identifies the final grade boundaries for this assessment, as agreed by the awarding panel:

Total marks available	60
Pass mark	23
Merit mark	31
Distinction mark	40

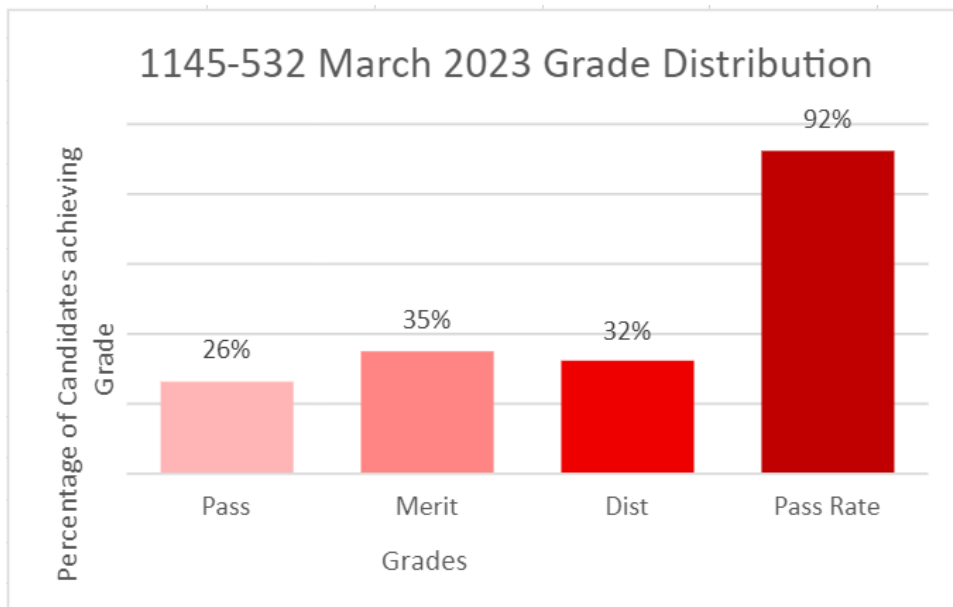The graph below shows the approximate distributions of grades and pass rate for this assessment:
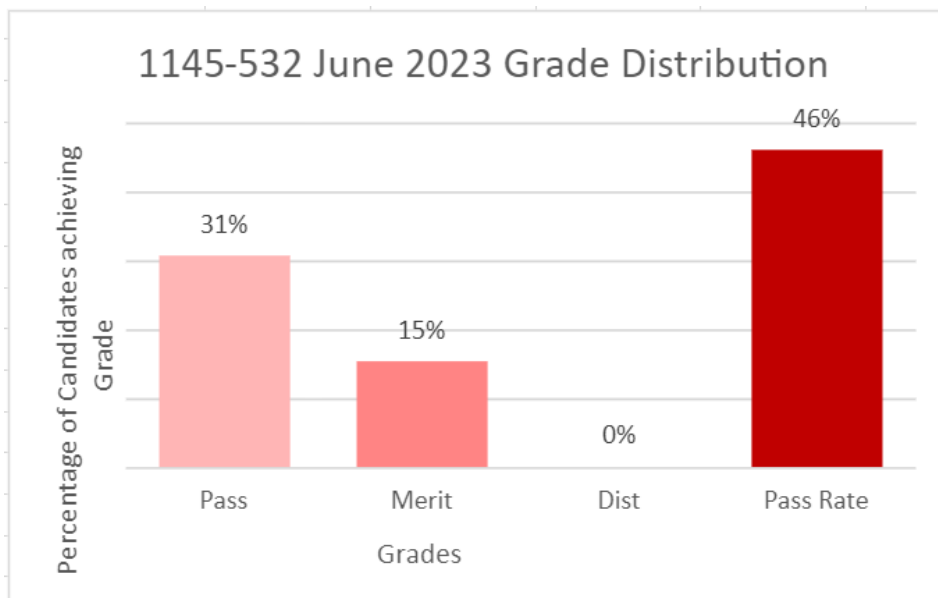
Assessment: **1145-532 Level 3 Engineering – Theory exam (2)**
Series: **June 2023**

Below identifies the final grade boundaries for this assessment, as agreed by the awarding panel:

Total marks available	60
Pass mark	23
Merit mark	31
Distinction mark	39

The graph below shows the approximate distributions of grades and pass rate for this assessment:

Chief Examiner Commentary

Assessment component: 1145-530 Level 3 Engineering – Theory exam

Series 1 – March 2023

Overall candidates' performance on the paper was not comparable to last year's. Candidates struggled in a number of areas in this examination. The questions covered a wide range of technical knowledge in the specification and were pitched at an appropriate level. The breakdown of available marks per unit was the same as previous papers.

There were very few questions that were answered well in this examination. One of the questions that was answered well was on material properties, however this question was knowledge recall, so a high level of achievement was expected. Another question that was answered quite well was on suitable materials for a given design. The two questions that were answered well were both on materials, which was perhaps a specific strength of this cohort.

Particular areas of weakness in the paper included the topic of electronics. These questions focused on semiconductors, large transformers and system diagrams. In most instances there was a lack of knowledge shown on these topics. A further topic that was a particular weakness in this examination was composite materials, with most candidates not able to show knowledge on this topic, however on the questions on electronics and composite materials a small number of candidates were able to achieve full marks.

The performance on unit 306 Engineering mathematics and statistics was poor, as it has been in previous series. Many candidates did not attempt the majority of these questions. The question where candidates were able to pick up marks in this section was on complex numbers. Other topics covered in this section where candidates were not able to answer well were Cartesian coordinates, trigonometry, and solving problems involving differentiation. Once again, a small number of candidates were able to achieve full marks on these questions.

The extended response questions (there are two within this paper) spanned nearly the full range of available marks, however compared to previous series a smaller number of candidates achieved the highest marking band. This is because consideration was not given to secondary or indirect implications of the factors that were discussed.

Overall, it was noted that this cohort candidates did not perform as well as previous cohorts and, in many instances, when candidates were asked about specific processes they would often answer about a different topic. This could be due to a lack of knowledge or not reading the question properly. There was also a lack of depth and breadth of knowledge from the majority of the candidates.

Series 2 – June 2023

There was a mixed, but generally poor, response to this paper by candidates, similar to the previous series. A high proportion of candidates did not use appropriate technical terminology when responding to questions. There were evident gaps in the fundamental knowledge of engineering practices and processes. Responses to understanding questions were fairly superficial, a notable proportion of candidates would give statements in their answers without supporting explanations or reasons.

There were very few questions that were answered well in this examination. One of the areas that was answered well was on definitions of materials, with candidates showing they could answer at least one of the questions on this topic. Candidates were also able to provide some good responses to the question on plastics forming methods, in many cases demonstrating that they had practical experience of using the vacuum forming process by describing the process steps in detail and in the correct sequence and therefore accessing the higher marks.

Particular areas of weakness included composite materials, heat treatment and joining methods, with candidates either showing gaps in knowledge or focusing on other areas of the specification that were not relevant to these questions. For instance, when asked about plastics joining methods regarding ultrasonic welding, many discussed thermal methods. Further challenging areas were discussing methods of evaluating design ideas, and conduction mechanisms. Here, candidates struggled to provide depth of detail in their evaluations or explanations. Lastly, gaps in knowledge regarding smart materials as well as manufactured materials and the design process were evident, making questions on these areas challenging for candidates.

Unit 306 Engineering mathematics and statistics is always an area candidates struggle with as it is focused on application of maths. A good proportion of candidates were able to access the marks relating to mean and median but the standard deviation and Interquartile range candidates were only partially attempted, or the questions were not attempted and a notable proportion of candidates applied incorrect methodologies or used the wrong formulae. However, there were a few candidates who achieved high marks for these questions.

Responses to the extended response questions (there are two in this paper) spanned the range of available marks. Many candidates demonstrated an amount of appropriate knowledge, although in some cases the use of correct technical terminology was limited (for example, referring to generic material types in the material selection question, rather than specific named materials). In addition, a high proportion of candidates did not consider the secondary or indirect implications of the subject matter or draw conclusions when discussing the topic.

Overall, it was noted that this cohort candidates did not perform as well as previous cohorts and there was also a lack of depth and breadth of knowledge from the majority of the candidates.

Centres are reminded of the City & Guilds Technicals 'Exam Guides' available here
Technicals in Engineering qualifications and training courses | City & Guilds (cityandguilds.com)

Assessment component: 1145-532 Level 3 Engineering – Theory exam

Series 1 – March 2023

Overall, candidates' performance on the paper improved when compared to last year. The questions covered a wide range of technical knowledge in the specification and were pitched at an appropriate level. The breakdown of available marks per unit was the same as previous papers. Most candidates demonstrated a good level of knowledge recall and understanding of the topics over the majority of the paper.

One of the topics that was answered well on this paper was on chip cutting processes. This was a knowledge recall question, so a good performance was expected. A further area that was answered well was on advantages of low carbon technologies. Candidates were able to show a good range of knowledge on these questions.

Compared to previous series, questions on virtual reality, augmented reality and cloud computing have been answered very well. This is likely due to an increased use of and reliance on these topics in candidates' day to day lives such as virtual reality headsets and augmented reality games.

The question paper as a whole was well answered so it is difficult to pick out areas of weakness, but one area that stands out is the disadvantage of low carbon technologies, which sticks out due to the cohort's strong performance on the advantages of low carbon technologies.

The extended response question was awarded the full range of marks. Most candidates were able to get into the second band of available marks. In the cases where candidates did not perform well on this question, they only focussed on a relatively small range of considerations in depth. To achieve higher marks, they needed to include a greater variety of considerations.

Performance on this paper was very strong with no particular areas of weakness. However, the main area candidates could have improved was their answer to the extended response question and including more variety of considerations. Some candidates may have benefitted from mapping their response out before answering in full, so any considerations could be listed out.

Assessment component: 1145-532 Level 3 Engineering – Theory exam

Series 2 – June 2023

The questions and paper as a whole met the requirements of the specification, were of a similar level to the previous papers and covered a good range of topics in the specification.

In general, although almost all candidates attempted all of the questions, this paper was typically not answered well. The performance was significantly weaker than the previous comparable cohorts. There were a number of weaknesses shown throughout the paper with gaps in knowledge, but there was also a distinct lack of depth and understanding. In many questions where candidates were asked for explanations or discussion a large proportion of candidates gave statements and lacked reasoning or justifications in their responses.

One topic that was answered well was how innovation contributes to economic growth and ways in which research and development can support the innovation of a product. Here, candidates showed a good depth of understanding of factors affecting innovation in engineering companies. However, they found the questions on waste-to-energy technologies and augmented reality challenging, providing responses that typically included less detail and depth than in prior series.

In terms of areas of weakness, when asked about cable types, candidates struggled to identify common types of electrical cables and their use. Candidates' responses on loom boards demonstrated a lack of knowledge of the subject matter, resulting in an inability to access the higher marks. A limited number of candidates were able to identify the basic components of the loom board, however, a very small proportion of candidates were able to partially explain how to make the board. Candidates' responses for tool selection were also notably weaker than in prior series with a very mixed response across the different tools. Candidates struggled to identify a suitable tool for the specified task e.g. cutting through a piece of material of 150 mm in one operation. These weak responses for cable types and tool selection were surprising as these are basic recall questions in a topic area which has historically been answered well. The structure and format of these questions was consistent with previous series.

Responses to the extended response questions spanned the full range of available marks. A good proportion of candidates demonstrated an amount of appropriate knowledge, using the correct technical terminology. A proportion of candidates listed items of legislation and their requirements but did not fully address the question by discussing how these affected employees. Further, most candidates did not consider the potential indirect or secondary effects of the legislation and therefore were unable to access the higher marks.

Centres are reminded of the City & Guilds Technicals 'Exam Guides' available here
Technicals in Engineering qualifications and training courses | City & Guilds (cityandguilds.com)

Synoptic Assignment
Grade Boundaries

Assessment: 1145-031
Series: 2023

Below identifies the final grade boundaries for this assessment:

Total marks available	60
Pass mark	25
Merit mark	35
Distinction mark	45

The graph below shows the approximate distributions of grades and pass rate for this assessment using the above boundary marks:

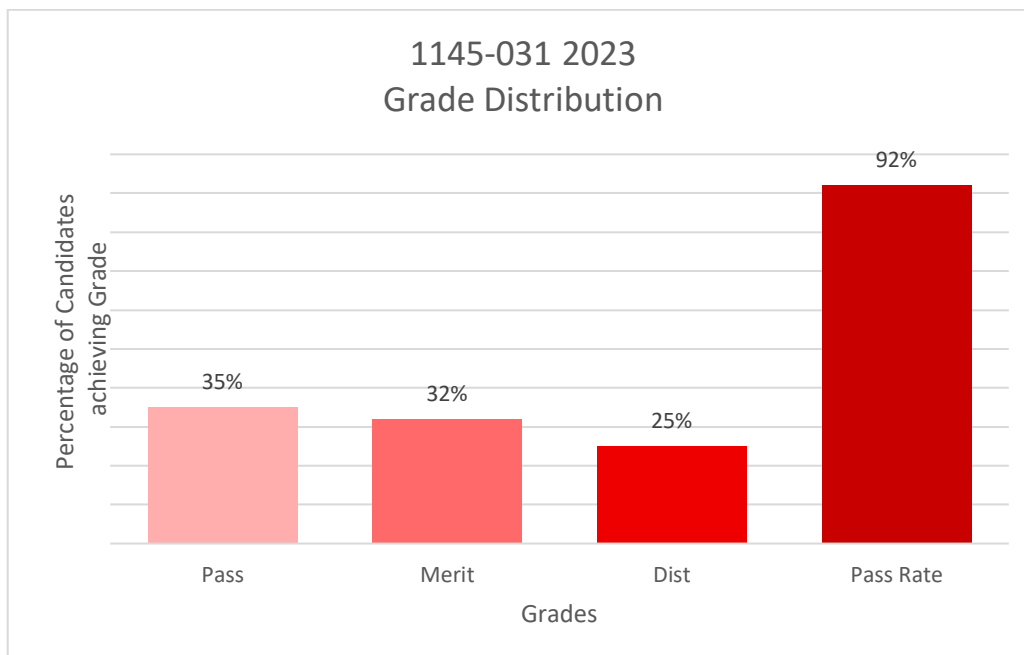
Assessment: 1145-034
Series: 2023

Below identifies the final grade boundaries for this assessment:

Total marks available	60
Pass mark	25
Merit mark	34
Distinction mark	43

The graph below shows the approximate distributions of grades and pass rate for this assessment using the above boundary marks:
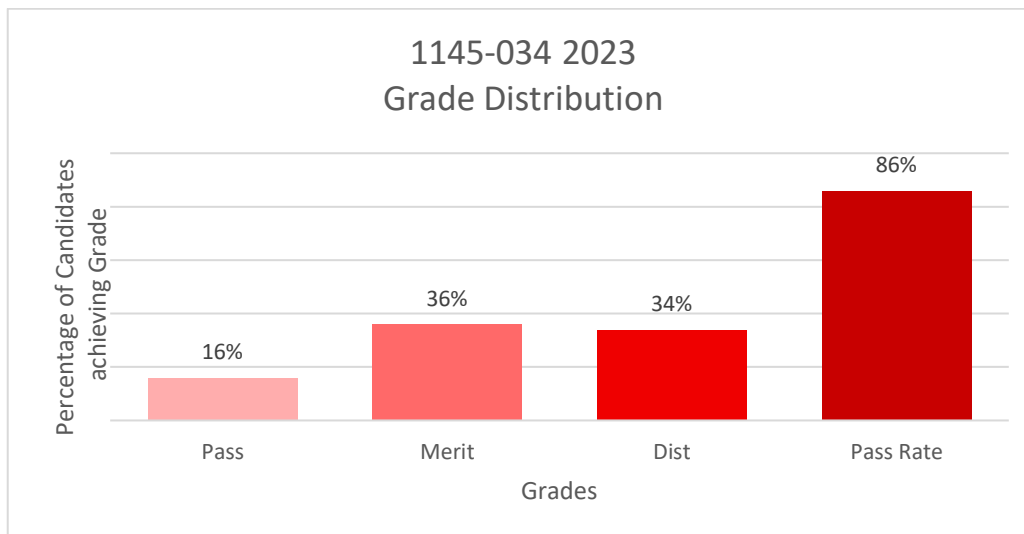

1145-034 2023
Grade Distribution

Pass: 16%
Merit: 36%
Dist: 34%
Pass Rate: 86%

(X-axis: Grades — Pass, Merit, Dist, Pass Rate)
(Y-axis: Percentage of Candidates achieving Grade)

Principal Moderator Commentary

Assessment component: 1145-031 Level 3 Engineering – Synoptic assignment (1)

The assignment was similar in level to the previous series. This view was reinforced by the evidence provided by the candidates, which was sufficient, valid and of appropriate quality to support marking and moderation.

The assignment involved the design and manufacture of an electronic motion detection system, with an associated movement control system to aim a device. The context was based on a television gameshow where contestants have to run through an area whilst paint balls are fired at them by the system.

This was carried out as a series of structured tasks, specified in the assignment brief. The assessment objectives assessed by this assignment were AO1 (Recall of knowledge), AO2 (understanding), AO3 (practical skills), AO4 (bringing it together) and AO5 (attending to detail / perfecting). In general, most candidates made good attempts at all tasks in the assignment.

AO1 (recall of knowledge) was generally well evidenced, with the design specification, investigation into potential designs, circuit diagrams and evaluation all using appropriate technical terms. For some candidates the evidence could have been improved by including annotated technical drawings.

AO2 (understanding) was generally appropriately evidenced. The main differentiator between the performance of different candidates was the level of explanation and annotation provided during the design activities. Best evidence included reasons for the criteria in the design specification and reasons for the selection of the electronic components and material(s) for the housing. Some candidates could have improved their evidence by including increased annotation on the microcontroller program, to indicate clear understanding of the sequence of activities being carried out.

A03 (practical skills) was typically appropriately evidenced, with relevant commentary on the practical observation form and pictures of the manufacturing operations in progress and the finished article. Almost all candidates provided effective and useful pictorial evidence of the completed item, supported by videos of testing. For a small proportion of candidates this could have been supported further by additional 'close up' images showing specific features.

AO4 (bringing it all together) was, in general, well evidenced, particularly in the factors considered when creating the design ideas and the evaluation.

Attending to detail (AO5) was typically evidenced well, with good use of supporting videos by a high proportion of candidates. Whilst the evaluations carried out by the candidates were mainly subjective in nature, these were reinforced by comments by the tutor assessors on the practical observation form.

Overall, it was clear that markers had considered awarding marks across the full range of AOs in all tasks; this is to be commended. It would assist moderation if centres could make or add comments to illustrate where assessment criteria were being specifically addressed.

Assessment component: 1145-034 Level 3 Engineering – Synoptic assignment (2)

The assignment was similar in level to the previous series. This view was reinforced by the evidence provided by the candidates, which was sufficient, valid and of appropriate quality to support marking and moderation.

The assignment involved the design and manufacture of a prototype automated delivery vehicle (ADV) which includes a safety system to prevent collisions. This was carried out as a series of structured tasks, specified in the assignment brief. The assessment objectives assessed by this assignment were AO1 (Recall of knowledge), AO2 (understanding), AO3 (practical skills), AO4 (bringing it together) and AO5 (attending to detail / perfecting). Most candidates made good attempts at all tasks in the assignment.

AO1 (recall of knowledge) was generally well evidenced, with the design specification, investigation into potential designs, circuit drawings, programs and evaluation all using appropriate technical terms.

AO2 (understanding) was typically appropriately evidenced. There was good evidence of understanding in the consideration of the design criteria, design sketches and evaluation. However, evidence could have been improved by including further statements explaining the reasons for choices or the implications of alternative options in the design of the ADV, and more detailed annotation of the microcontroller program, to demonstrate clear understanding of the sequence of activities being carried out.

A03 (practical skills) was typically appropriately evidenced, with pictures of produced items and relevant commentary on the practical observation form. Almost all candidates provided effective and useful pictorial evidence of the completed item, supported by videos of testing. For a small proportion of candidates this could have been supported further by additional 'close up' images showing specific features.

AO4 (bringing it all together) was, in general, appropriately evidenced, particularly in the justification of the final design idea and the evaluation.

The evidence for Attending to detail (AO5) could have been improved in some cases. The evaluations carried out by the candidates were mainly subjective in nature; these were reinforced by subjective comments by the tutor assessor on the practical observation form. These could have been improved by including some objective testing of performance.

Overall, it was clear that markers had considered awarding marks across the full range of AOs in all tasks; this is to be commended. It would assist moderation if centres could make or add comments to illustrate where assessment criteria were being specifically addressed.