Course report 2023

Higher Design and Manufacture

This report provides information on candidates' performance. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative, and to promote better understanding. You should read the report in conjunction with the published assessment documents and marking instructions.

The statistics in the report were compiled before any appeals were completed.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2022: 2,280

Number of resulted entries in 2023: 2,035

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	249	Percentage	12.2	Cumulative percentage	12.2	Minimum mark required	109
B	Number of candidates	363	Percentage	17.8	Cumulative percentage	30.1	Minimum mark required	90
C	Number of candidates	504	Percentage	24.8	Cumulative percentage	54.8	Minimum mark required	72
D	Number of candidates	569	Percentage	28	Cumulative percentage	82.8	Minimum mark required	53
No award	Number of candidates	350	Percentage	17.2	Cumulative percentage	100	Minimum mark required	N/A

Please note that rounding has not been applied to these statistics.

You can read the general commentary on grade boundaries in the appendix.

In this report:

- ‘most’ means greater than 70%
- ‘many’ means 50% to 69%
- ‘some’ means 25% to 49%
- ‘a few’ means less than 25%

You can find more statistical reports on the statistics and information page of SQA’s website.

Section 1: comments on the assessment

Question paper

The question paper performed as expected. Feedback from the marking team suggested that it discriminated well and was fair in terms of course coverage and level of demand.

In some questions, most candidates did not demonstrate the knowledge and understanding required at Higher level.

Assignment

The assignment performed as expected.

All tasks generated a wide range of responses and marks.

Section 2: comments on candidate performance

Areas that candidates performed well in

Question paper

Question 1(b)

Many candidates answered this question well. Candidates gained marks if they gave a correct explanation to an incorrect process, for example ‘The ABS wheels have been vacuum formed as it produces the intricate detail.’ There was no requirement for candidates to cover both products in their answer.

Question 1(c)

Many candidates answered this question well. Many candidates gave a good range of descriptions, covering both function and safety.

Question 1(e)

Many candidates answered this question reasonably well. Some candidates explained the benefits of standard components for the consumer rather than the manufacturer. These responses did not gain marks.

Question 2(b)

Most candidates answered this question reasonably well. Most candidates provided a clear explanation of the suitability of drop forging.

Question 2(c)

Many candidates answered this question well. A few candidates explained the benefits of using CAD in general, without relating their responses to the design of the carabiner.

Question 3(b)

Some candidates answered this question reasonably well. However, some candidates gave a generic answer without the detail required to access the full range of marks at Higher level.

Question 3(c)

Many candidates answered this question reasonably well. Many candidates gave valid explanations about the benefits and drawbacks of using sub-contractors.

Question 4(c)

Many candidates answered this question well. Many candidates described the meaning of the term ‘planned obsolescence’ and gave a relevant example of how planned obsolescence can influence product design.

Question 5(a)

Many candidates answered this question well. Many candidates gave valid explanations about why elastomers were suitable for the seal and strap of the swimming goggles.

Question 5(c)

Many candidates answered this question reasonably well. Some candidates did not give a detailed enough description of how companies could maintain or improve their market share, so did not access the full range of marks. For example:

- ‘Companies could use TV adverts to maintain their market share’ gained 0 marks.
- ‘Packaging could be changed as this may spark interest in the business’ gained 1 mark.

Question 6(c)

Many candidates answered this question well. They demonstrated an understanding of how manufacturers could reduce the negative environmental impact of their products.

Assignment

Producing a specification

Most candidates demonstrated the ability to write a detailed specification including exact details drawn from the research and briefs such as cost, functional aspects, sizes of products to be held, and aesthetic and ergonomic requirements. Most candidates gained marks from the middle or top bands.

Generating initial ideas

Most candidates used the theme very well, demonstrating an ability to generate creative ideas that addressed the brief. Most candidates gained marks from the top bands for this section.

Refining ideas

Most candidates made at least some decisions relating to function, sizes, materials and/or assembly methods, and the product’s aesthetics. Candidates who explored several aspects of their proposal and used their specification well created the best opportunities to refine their design. Most candidates gained marks from the top bands.

Application of design knowledge

Most candidates demonstrated an understanding of the brief and applied knowledge relating to functional and aesthetic aspects. Many candidates applied knowledge of ergonomics and/or performance when developing their proposal. Candidates who used their specification to explore and refine created the best opportunities to record their knowledge. Some candidates carried out costings or part costings using the data booklet or worked out complex sizes. Many candidates gained marks from the middle or top bands for this section.

Applying graphic techniques

Many candidates used a good range of graphics effectively to communicate the development and details of their proposal. Candidates who gained marks from the top band typically used manual graphics effectively to communicate rough ideas, component part or manufacturing detail, detail of functional parts, detailed views, dimensions, and assembly details such as hidden detail or exploded views. Most candidates used the dimensioned drawings in their planning for manufacture pro forma. Some candidates used CAD graphics effectively. Most candidates gained marks from the middle or top bands for this section.

Producing a plan for commercial manufacture

Many candidates completed the pro forma with reasonable information and clarity. Most candidates attempted the part table and provided some detail about the product and its component parts. Many candidates provided some detail about the product's assembly using text or graphics. Candidates who had good refinement of the assembly and manufacturing detail created the best opportunity to communicate detail of component parts.

Areas that candidates found demanding

Question paper

Question 1(a)

Many candidates responded poorly to this question. Some responses contained repetition and/or did not explain six different properties or characteristics of the materials.

Many candidates only stated the property or characteristic of the material without relating it to the product, for example, 'The tubular stainless-steel frame is strong.' This response gained 0 marks. To gain a mark, the candidate must explain why the property or characteristic is suitable, for example, 'The tubular stainless-steel frame is strong. This means it can hold the weight of the user.'

There was no requirement for candidates to cover materials from both products in their answer.

Question 1(d)

Many candidates answered this question poorly. Many candidates did not meaningfully discuss the aesthetics of the go-karts or reference aesthetic aspects. Many candidates did not access the full range of marks.

Question 3(a)

Many candidates responded poorly to this question. Many candidates did not relate anthropometrics to a specific part of the body and then describe how the body part interacts with the product. 'The diameter of the steering wheel must be designed to fit the user's grip size or the length of the user's hand' would gain marks.

Markers ignored incorrect percentile ranges in candidate responses.

Question 4(a)(i)

Many candidates answered this question poorly. Many candidates did not describe how a product had been influenced by technology push. Some candidates gave very short responses that were worth 1 mark. Many candidates gave a description of technology push but did not give a detailed description of how this is used in products they are familiar with, which meant they did not gain marks.

Question 4(a)(ii)

Many candidates answered this question poorly. Many candidates did not describe how a product had been influenced by market pull. Some candidates gave very short responses that were worth 1 mark. Many candidates gave a description of market pull but did not give a detailed description of how this is used in products they are familiar with, which meant they did not gain marks.

Question 4(b)

Many candidates answered this question poorly. Some candidates gave a simple description of the method.

Candidates who did not give a detailed enough description of carrying out research into the needs of the target market, did not access the full range of marks. For example, the response, 'Questionnaires or surveys could be used to ask the target market what they want or need from a product' only gained 1 mark.

Question 5(b)

Many candidates answered this question poorly. Many candidates did not describe how production and planning processes could be used to improve efficiency. Many responses either generically discussed production or planning systems or did not describe how they could be used to improve efficiency. Many candidate responses to this question did not demonstrate knowledge and understanding of this area of the course.

Question 6(a)

Many candidates answered this question poorly. Many candidates did not demonstrate the required knowledge and understanding of material identification.

Some candidates identified tests and gave little to no description, for example 'A flame test could be used to test the material.' This statement was not enough to gain a mark because it did not describe the process of identification.

Some candidates did not specify the materials in their description, for example wood, metal, or plastics.

Question 6(b)

Many candidates answered this question poorly. Many candidates did not correctly outline the factors that would influence the choice of assembly method. Many candidates did not demonstrate knowledge and understanding of this area of the course.

Question 7

This question was designed to assess candidates' understanding of how a variety of graphic techniques can be used at different stages of the design process.

There was a wide range of responses to this question. A few candidates answered well, using valid examples to illustrate their points. However, some candidates gave generic answers that did not demonstrate clear understanding.

Many candidates showed a lack of understanding of the variety of graphic techniques that could be used in the design process, giving a very brief description of the types of graphics with elements of repetition over each description.

Many candidates incorrectly gave a detailed description of how a variety of models can be used at different stages of the design process. These candidates did not gain any marks because they did not answer the question.

Many of the responses were very generic and did not demonstrate a deeper understanding of types of graphic techniques, stages of the design process, and information gained.

Assignment

Exploring ideas

Although there was an improvement this year in candidates using the specification to explore and problem-solve, some candidates did not produce evidence to access marks in the top bands. A few candidates used SCAMPER, and this approach allowed them to pick up some marks; however, in the main, it limited the response of stronger candidates. Many candidates produced insufficient evidence for marks in the top bands as they demonstrated limited meaningful exploration of a range of aspects, limited problem solving, and/or limited use of knowledge to drive improvements.

A few candidates explored their ideas using CAD models, which limited their exploration. Some candidates explored more than one idea but showed limited diversity and a lack of depth or range in the aspects they explored. Candidates who made limited or no use of their specification failed to explore alternatives for the many different aspects of the task required to evolve the proposal.

Application of knowledge of materials and assembly processes

Although most candidates demonstrated adequate knowledge, a few candidates did not show any application of knowledge of processes from the Higher course. This was a common issue with candidates who focused on wood products. A few candidates simply labelled materials or processes or did not demonstrate their applied knowledge until the planning for commercial manufacture pro forma.

Most candidates that showed limited exploration or detail in their designs had reduced opportunities to apply and communicate a breadth of knowledge.

Applying modelling techniques

Most candidates produced adequate evidence of modelling to generate ideas, test, or refine aspects of their proposal. Many candidates, however, did not access the marks from the top bands. Some candidates did not make it clear what they had learned or refined by using the model, and some models did not communicate anything more than the sketches already had.

Some candidates modelled using modelling clay. At times, these models did not serve a purpose, were not used well, and lacked appropriate detail to develop the proposal. Candidates who used CAD models typically achieved marks for communicating or refining sizes. However, CAD models were often repetitive and limited candidates' opportunities for detailed exploration.

Section 3: preparing candidates for future assessment

Question paper

Teachers and lecturers should use Understanding Standards material to help prepare candidates for the question paper. This material includes candidate evidence with commentaries and a recording of a webinar about the question paper. Teachers, lecturers, and candidates can also access past papers and marking instructions on SQA's website.

Candidates should practise exam techniques and work on producing acceptable responses to the questions that can feature in the Higher question paper.

Many candidates do not describe or explain their answers in sufficient detail for Higher level. Candidates should practise producing extended responses when preparing for the question paper. Carrying out practical activities can help to enhance their knowledge for responding to certain questions, for example questions about methods used to identify materials.

Candidates should familiarise themselves with the technical vocabulary in the course specification. This should help them to produce acceptable responses in the question paper.

Candidates should consider the mark allocation for individual questions when producing a response. To achieve full marks for a 4-mark question, candidates generally have to provide four different correct statements or give an extended response.

The course specification contains a section called 'Skills, knowledge and understanding for the course assessment'. This section lists the skills, knowledge, and understanding sampled in the question paper. Teachers and lecturers should familiarise themselves with this to prepare candidates for the question paper.

Assignment

Assignments for session 2023–24 onwards must not exceed 12 A3 sheets (or equivalent). This number includes the four pro formas: research, research and specification, planning for commercial manufacture, and practical modelling skills. From session 2023–24, candidates will be required to carry out their own research and complete the section on practical modelling.

Selecting a brief

Teachers and lecturers should help candidates select a brief that best suits their ability. Teachers and lecturers should discuss the pros and cons of each task with candidates and ensure that they understand the breadth and depth of skills they need to demonstrate, and how they might do this, before making a final decision on their brief.

Teachers and lecturers could consider the following points to discuss with candidates:

- What research will you carry out and how will this help you develop a unique solution?
- How could your ideas differ from existing solutions?

- What opportunities could you find for modelling?
- What kind of things will you need to sketch for this task? Does this suit your graphic ability?
- How can you incorporate knowledge of materials and processes from the Higher course?
- What areas of this task could you explore and refine?

Planning for manufacture

Teachers and lecturers should ensure that all candidates have the planning for commercial manufacture pro forma. This pro forma is the first section of the assignment markers judge. For this reason, candidates must include all information for this section on this pro forma, and not in any fold-out sections or other pages throughout the assignment. The plan should include a sketch or model of the final product, a completed part table, major dimensions of the assembled solution, and detailed dimensions of some of the component parts.

Overly simplistic parts, such as flat slabs, do not allow for an appropriate level of detail at Higher level. Teachers and lecturers can help candidates improve the level of detail in their parts by providing opportunities to look at the manufacturing and assembly features of component parts. Candidates can communicate detail through graphics or annotations.

Carrying out research into a given brief

Teachers and lecturers can use Understanding Standards materials and the SQA-produced research pages for session 2022–23 to help prepare candidates for the research section. To achieve marks in the top band, research must be valid in terms of the brief and suitable to generate specification points.

Candidates should demonstrate use of techniques and research a range of issues. This should include sizes of items to be stored or any restrictions, anthropometric data, location and/or site details, and functional, aesthetic and performance requirements. Simply gathering images is not valid research. To count as valid research, images should be accompanied by a conclusion the candidate has drawn from them.

Producing a specification

Candidates can gain 1 mark for including points from the brief. Candidates must draw the remainder of their points from their research. If candidates base a point on their opinion or do not write it as a specification point, they cannot gain marks. A specification should contain exact details from the research.

Generating initial ideas

Candidates who access the full range of marks show diversity in different aspects of their ideas, such as how the design functions or how parts are arranged, showing sufficient detail in the graphics, models, or annotations to explain how ideas addressed the brief.

Teachers and lecturers should encourage candidates to select idea generation techniques appropriate to the brief. Using good theme-related images or models can help candidates generate creative and diverse ideas. Candidates do not need to state the techniques that they have used or waste valuable space displaying morphological tables.

Exploring ideas

Effective exploration should be meaningful and driven by a problem-solving approach. Teachers and lecturers should prepare candidates during the course to use the points in the brief and specification to identify a range of areas to fully explore in their proposal, for example:

- options for different functional requirements
- interaction of the user ergonomics
- theme, size, or cost restrictions
- materials, manufacturing, or assembly

Candidates who explore more than one idea are unlikely to access marks beyond the middle band because exploring additional ideas is typically repetitive and/or lacks depth or breadth of issues.

Using SCAMPER can limit candidate responses because there can be insufficient meaningful exploration and limited options to achieve marks in the top band. Relying on SCAMPER can also limit candidates' opportunities to pick up marks in application of knowledge sections.

There are resources on the Understanding Standards website to support teachers, lecturers, and candidates with this section. These include examples of highly effective exploration with accompanying commentary and skill builders to recognise exploration pathways and generate meaningful exploration.

Refining ideas

Candidates who refine their ideas effectively use the details in the specification and models to make decisions. They include details of component parts and their features and demonstrate how different components assemble. Teachers and lecturers should encourage candidates to use the sizes of the standard components as these provide an opportunity to inform decisions on how their components could be designed to attach to them, improving detail in their work.

It is important for candidates to carry out some exploration to ensure they have sufficient opportunities to record a range of decisions.

Application of design knowledge

Teachers and lecturers should provide opportunities for candidates to practise annotation during class tasks. Activities and resources are available on the Understanding Standards website to help candidates improve this skill.

A few candidates submitted assignments that were unnecessarily text heavy. Candidates who accessed marks from the top band created opportunities to apply design knowledge by exploring a range of aspects from the specification.

Candidates who apply design knowledge well:

- demonstrate a good understanding of how different aspects of the product function to be fit for purpose
- demonstrate a good understanding of how the user interacts with the product
- make use of size restraints
- use standard components effectively
- meet the aesthetic requirements

Candidates who calculate simple costs for some or all components, calculate sizes, and record findings of using models to test ideas also gain marks in this section.

Application of knowledge of materials and assembly processes

Teachers and lecturers should provide candidates with an opportunity to disassemble and explore components and their features. This can help candidates to include an appropriate level of part detail in their design work. Candidates who label and list generic properties or facts about processes can only access marks from the lower bands.

It is important for candidates to explore a range of viable materials and processes so they can apply breadth and depth of knowledge to access marks from the top bands. Candidates who apply knowledge during their exploration and refinement to compare or select appropriate materials, processes, and assembly methods for their components tend to achieve higher marks. Some candidates also consider the features of components such as incorporating features of diecast or injection-moulded parts.

Using graphics

This section assesses the use of a range of graphics. Teachers and lecturers should prepare candidates during the course by setting tasks to use a range of different graphics. This may include graphics such as quick sketches, 2D or 3D exploded details, hidden detail, scale drawings, detailed views, dimensioned sketches or drawings, and 2D and recognised pictorial sketches. These tasks could be studies of simple component parts, including their manufacturing features and assembly details. Candidates should understand how different graphics are used as they progress through a design task.

Applying modelling techniques

Candidates who achieve higher marks in this section use models to generate or communicate initial ideas, explore aspects of their design, and refine details relating to interaction, sizes, or assembly. They also communicate something new or something they have learned from using the models.

Teachers and lecturers should prepare candidates before the assignment by providing an opportunity to use models for a range of purposes. Candidates should know to use models when they have difficulty sketching an idea or when they can learn something meaningful from a physical or CAD model. As the Higher tasks are often large products, candidates benefit from working full-size to visualise space. They can do this by marking out space or heights on walls or floors.

Candidates can also use modelling to explore how to use the standard components. Modelling for this section can be rough in nature, however, candidates can use modelling clay to create models suitable for Higher. Candidates who use CAD modelling usually gain some marks for communicating or working out sizes. CAD models tend to be repetitive and can be difficult for candidates to learn from or explore effectively with.

Demonstrating practical modelling skills

Teachers and lecturers should ensure that candidates have the practical modelling skills pro forma.

Only practical models can gain marks in this section. CAD models cannot gain marks.

Candidates should include clear pictures of any models they use during the assignment that demonstrate detail or skill. They can include different pictures to ensure the detail of the models is clear. Pictures should include a steel rule to communicate scale or proportion.

Candidates can generate evidence by demonstrating repetition of detail, accurate spacing, complexity of part, producing a scale component or model, creating a working part, skilled use of appropriate materials, and manufacturing one of the standard components accurately.

Appendix: general commentary on grade boundaries

SQA's main aim when setting grade boundaries is to be fair to candidates across all subjects and levels and maintain comparable standards across the years, even as arrangements evolve and change.

For most National Courses, SQA aims to set examinations and other external assessments and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional grade C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional grade A boundary)

It is very challenging to get the standard on target every year, in every subject at every level. Therefore, SQA holds a grade boundary meeting for each course to bring together all the information available (statistical and qualitative) and to make final decisions on grade boundaries based on this information. Members of SQA's Executive Management Team normally chair these meetings.

Principal assessors utilise their subject expertise to evaluate the performance of the assessment and propose suitable grade boundaries based on the full range of evidence. SQA can adjust the grade boundaries as a result of the discussion at these meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper or other assessment has been more, or less, difficult than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper or other assessment has been more difficult than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the question paper or other assessment has been less difficult than usual.
- Where levels of difficulty are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from question papers in the same subject at the same level tend to be marginally different year on year. This is because the specific questions, and the mix of questions, are different and this has an impact on candidate performance.

This year, a package of support measures was developed to support learners and centres. This included modifications to course assessment, retained from the 2021–22 session. This support was designed to address the ongoing disruption to learning and teaching that young people have experienced as a result of the COVID-19 pandemic while recognising a lessening of the impact of disruption to learning and teaching as a result of the pandemic. The revision support that was available for the 2021–22 session was not offered to learners in 2022–23.

In addition, SQA adopted a sensitive approach to grading for National 5, Higher and Advanced Higher courses, to help ensure fairness for candidates while maintaining

standards. This is in recognition of the fact that those preparing for and sitting exams continue to do so in different circumstances from those who sat exams in 2019 and 2022.

The key difference this year is that decisions about where the grade boundaries have been set have also been influenced, where necessary and where appropriate, by the unique circumstances in 2023 and the ongoing impact the disruption from the pandemic has had on learners. On a course-by-course basis, SQA has determined grade boundaries in a way that is fair to candidates, taking into account how the assessment (exams and coursework) has functioned and the impact of assessment modifications and the removal of revision support.

The grade boundaries used in 2023 relate to the specific experience of this year's cohort and should not be used by centres if these assessments are used in the future for exam preparation.

For full details of the approach please refer to the National Qualifications 2023 Awarding — Methodology Report.